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In The

Supreme Court of the United States

October Term, 1997

KUMHO TIRE COMPANY, LTD., KUMHO U.S.A., INC., and HERCULES TIRE & RUBBER COMPANY, INC.,

Petitioners,

v.

PATRICK CARMICHAEL, AN INDIVIDUAL AND FATHER AND NEXT OF KIN TO PATRICK CARMICHAEL, JR., A MINOR, LUZVIMINDA CARMICHAEL, AN INDIVIDUAL, MOTHER AND NEXT FRIEND OF CARINA HORN, A MINOR, AND ADMINISTRATRIX OF THE ESTATE OF JANICE HORN, CARINA HORN, A MINOR, LEONA CARMICHAEL, SHAMEELA CARMICHAEL, NATIMAH CARMICHAEL,

Respondents.

On Writ Of Certiorari To The United States Court Of Appeals For The Eleventh Circuit

JOINT APPENDIX
VOLUME II, PAGES 105 TO 435

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[p. 1] IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

PATRICK CARMICHAEL, etc., et al.,	•	
Plaintiffs,	•	
Vs.	•	CV-93-0860-CB-S
SAMYANG TIRES, INC., et al.,	•	
Defendants.	•	

CARMICHAEL/CARSON VOL. I

The testimony of DENNIS P. CARLSON, JR., taken at the law offices of HELMSING, LYONS, SIMS & LEACH, 2000 LaClede Building, 150 Government Street, Mobile, Alabama, on the 7th day of March 1995, commencing at approximately 10:20 a.m.

[p. 2] APPEARANCES

• • •

[p. 3] INDEX

• • •

[p. 6] DENNIS P. CARLSON, JR., the witness, after having first been duly sworn to tell the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

EXAMINATION

BY MR. BABINGTON:

Q State your name, please.

A Dennis P. Carlson, Jr.

Q What is your date of birth?

A 10/26/47.

Q How old does that make you right now?

A Forty-seven, I think.

Q What is your residence address?

A 2537 Carolina Avenue, Louisville, Kentucky.

Q How long have you lived there?

A Two months.

Q You used to live, as I understand it, in Georgia; is that correct?

A Yes.

Q What was the reason for your move to Kentucky?

A I'm working for George Edwards, Incorporated now. I changed jobs.

* * *

[p. 7] Q How many employees does that entity have?

A Three.

Q Who are they?

A George Edwards, myself and a secretary.

Q Do you have a supervisor, per se, in your work there?

A Well, George Edwards right now is my supervisor, if you would.

Q What are your duties in a general sense?

A I look at tires and reconstruct accidents.

Q That's pretty much it?

A That's about it.

Q On a day-to-day basis what do you do?

[p. 8] A I look at tires, I read depositions and write reports or go out and look – do an accident reconstruction.

* * *

Q Do you do any nonlitigation work at this time?

A Well, the work I do, of course, all has the [p. 9] potential to go to litigation. But a very small percentage of it actually gets even to the deposition stage.

Q Well, what I'm talking about is do you do any work that is for industry where there's not a litigation already or ing or threatened?

A Not at the present.

Q So it would be fair to say that all of your work is related to lawsuits at this time?

A It has the potential to be related, yes.

Q Or actually is related to an ongoing lawsuit?

A Yes.

* * *

[p. 11] Q Now in your resume you list that you worked for Michelin America's Research and Development in the period 1977 to November of 1987?

A Yes.

* * *

[p. 12] Q What Michelin location or office did you work in or out of?

A Michelin America is located in Greenville, South Carolina and I worked there in the Greenville location for approximately five and a half years. And I worked at the Laurens test track for approximately five years.

* * *

Q When you were employed at Michelin, did you ever do any control failure simulation testing?

A Yes.

Q Can you define what that is for me?

A What we do is we have a great deal of testing [p. 13] that essentially is designed to make a certain part of the tire fail and in that way we can compare a candidate tire or candidate piece of rubber or construction, whatever you would, to our standard tire.

And this was my job for much of the time at Michelin, at least five years, was to do tests that developed a

certain type of failure, one of which being edge belt separation.

Q Were the tires that you tested in this fashion all Michelin tires?

A No.

Q What types of tires did you test?

A We had many competitor tires. You name it, we probably tested it.

Q Did you ever test a Kumho manufactured tire?

A Not that I recall specifically but I'm sure we tested them in some tests.

Q Well, I want what you can specifically recall.

A Okay.

Q Can you recall specifically ever testing a Kumho manufactured tire?

A Not specifically.

Q And can you recall ever testing a Hercules [p. 14] tire?

A Yes.

Q Do you know who manufactured the Hercules tire that you tested?

A I don't recall.

Q Did you ever test a Hercules Superior XII tire?

A I recall testing a Hercules Superior but I don't remember if it had a designation after it.

Q Did you specifically recall that test?

A I recall a handling test that used a Hercules tire.

Q And what would a handling test consist of?

A At this time we were looking at wet traction and the handling under wet traction conditions.

Q And what would be the significance of or purpose of that test?

A Just compare it against the Michelin tire to see how other people solved the problem of wet traction.

Q Do you have any independent recollection about what the results of that test were at this time?

A If I remember, it did well –

[p. 15] Q Well, first, do you have any independent recollection about what the results of the test were?

A I do not recall the specifics. I remember a general recollection about it.

Q Have you seen or refreshed your recollection by reviewing any test reports or conclusions?

A No, I could not take any of the test results when I left Michelin.

Q And I take it over your years with Michelin you performed a variety of tests; is that correct?

A Yes.

Q And how many such tests, control failure simulation tests, would you say you performed?

A It would be in the thousands.

Q And over what length of time would you have performed those?

A I spent a year and a half doing machine tests and then I spent four years in tire design and then I spent five years at the test track doing tests. And so direct testing was approximately six and a half years.

But while I was in tire design there, I was requesting tests and we had all sorts of tests that were requested. I was in charge of that, so I was [p. 16] actually involved with testing at that time also but in a different perspective.

Q Now going back to this test of the Hercules Superior tire, as I understand, you can't remember the designation, you say you do have some general recollection –

A Yes.

Q – at this point about what the test showed or resulted in?

A Well, I'm not sure –

Q What was that?

A – I can give you specific results or even general results because of my secrecy agreement with Michelin. And that was not my test, it was one of my friends' tests, one of the associates.

Q Did you actually conduct that test?

A I did not request it and I did not do the test.

Q Did you participate in any fashion in the tests?

A I did participate, yes.

Q What did you do specifically?

A Well, the driver had noticed something special [p. 17] or different and he asked me to ride with him to verify his conclusion, the test driver.

Q So there was a test on a track as opposed to using a dynamometer?

A Yes.

Q Can you describe what the test protocol was?

A No, I cannot.

Q You cannot because of your secrecy agreement or you cannot because you don't recall it?

A No, because of the secrecy agreement. I think that would be a violation of the secrecy agreement. I can tell you general things about it, it was a wet traction type test and it had something that was somewhat significant to the driver.

Q Well, are you relying in any way on the experience you had in that test with respect to any opinions or conclusions or any work you've done in this case?

A I think it has no relevance to this case because it involved wet traction and this involves separation resistance.

Q So there's no knowledge or experience that you gained from this test that you participated in while [p. 18] you were at Michelin that is relevant to this case or bears upon your opinions in this case?

A I don't think so.

Q Did you ever conduct any control failure simulation testing that was designed to isolate the causes for steel belt separation?

A Yes.

Q Tell me what you did in that regard.

A Well, I was responsible for the test quality of several separation tests. Michelin has one separation test that is used primarily for heavy truck tires and I ran that test for five years.

Q Did you do anything else as far as control failure simulation testing for belt separation?

A We had other tests that we were trying to develop to find a reliable test method for belt edge separations and I worked on that. I also examined the tires after the tests, after they had been decorticated.

Q Now you just used the word decorticated, what does that mean?

A Cutting the tire up.

Q How?

[p. 19] A It was with knives and nippers, done manually.

Q In what fashion, would you cut it cross section or lengthwise?

A We usually did what is called a decap where we would peel the tire back and peel it back between the belts to view the surface to see – we were testing, you

know, all the time new rubbers or new constructions to improve belt edge separation resistance.

And I looked at these because I needed to see if my test method was correct and to see if our evaluation was correct.

Q What were you concerned about as far as your test method?

A Well, it's a very difficult test to maintain accuracy with.

Q Why is that?

A Well, it's very hard to develop a reliable and consistent test for belt edge separations.

Q And what are the reasons for that?

A Because it is so variable.

Q Does that mean there were a lot of different reasons why belts will separate?

A Yes.

[p. 20] Q What are some of the reasons why belts will separate?

A Well –

Q Or let me withdraw that question. Would you list for me all the potential causes of a belt separation?

A Okay. Well, obviously you can have a bad design of your product, the tire can be a bad design. In other words, the rubbers may not have the sufficient adhesion or the belt construction can be bad in some respects. Those are design factors.

Production factors, they are numerous. Contamination is perhaps the biggest thing. You can get dirt on the product. You can get water on the product as the tire is being made. You can get oil or grease from a person's hands.

Other things are that the products could be overaged, they can not be put in the tire and cured soon enough, or you can assemble the tire incorrectly.

Q Anything else?

A Well, those are the things that are related to the tires. There are a few others that I'll try to remember those, but – then, of course, there are abuse [p. 21] factors.

Q And what abuse factors are there?

A Well, the majority – the major one, of course, is overdeflection of the tire.

Q Can you define that for me?

A Well, it's either running the tire overloaded or underinflated. There are people who have used the word overdeflected to – because it's a little easier to say than overloaded or underinflated.

Q Any other abuse factors?

A Well, you can – you can run the tire too fast.

Q Anything else?

A There are others that can potentially cause this but they are not seen generally on passenger vehicles because the tire wears out. But if you ran around curvy

roads all day and kept the tire hot and everything, you might be able to generate an edge belt separation, but the tire generally would wear out before that would occur.

Q What do you call that, is there a technical name in the field for that problem?

A It's called derive-induced separation, but [p. 22] like I say, it's impossible for a driver to really do that. We can do it in a test track or something like that but you can't do it out in the field.

Q What was the first word?

A Derive – steering.

Q Derive?

A Derive is the French word for steering. Or slip angle, excuse me.

Q Any other an abuse factor that would lead to a separation?

A There are none that are practical.

Q Well, even if they're impractical.

A Okay. Well, most people for tire companies, when they get into stuff like this they say an impact can cause that. And that's just not true. So –

Q We'll get to that later.

A Yes.

Q What about anything else that's an abuse factor that you're aware of that can cause separation or that is a potential cause of separation?

A I think that should cover it.

Q Any other factors other than design, production, assembly or abuse factors that would lead [p. 23] to separation?

A Those are the big categories.

Q Anything else?

A I think that's it.

Q Now you stated that it's very difficult –

A Oh, excuse me, one other. There are some cases where you can have a puncture and if the puncture is not repaired carefully you can see where the separation can grow from the puncture hole.

Q Anything else?

A That's it.

Q You stated that it's very difficult to create a reliable test for determining belt separation or tread separation causes.

A Yes, sir.

Q Have you ever done a study of what the test error rate would be for those types of tests?

A Well, the Michelin test had a very good – the word co-efficient of variation.

Q Is that the same thing as an error rate?

A Close, but statistics – co-efficient of variation, if I remember correctly, is generally your standard deviation of the test divided by the mean. [p. 24] And as far as I

know Michelin has the only test in the industry that has a very, very low co-efficient of variation.

There are other tests that are used by other companies, and as far as I'm concerned they're not very reliable. They are good tests to get rid of tires that are very, very bad in separation resistance, okay, they will determine a first cut analysis, if you will.

Q What tests are those?

A Well, they usually involve running the tire against a steel road wheel and putting slip angle in a program sequence.

Q These are the tests that you consider to be unreliable?

A Yes.

Q What is the name of the Michelin test that you consider to have a better error rate than those tests?

A Well, we call it the cleavage test.

Q How do you spell that?_

A Well, cleavage.

Q Okay. Is that type of test something that's generally used in the industry or just by Michelin?

A As far as I know it's only a Michelin test.

[p. 25] Q Can you describe for me how you would conduct such a test?

A I doubt it.

Q What do you mean you doubt it?

A The secrecy agreement, I don't think they would allow me to do that.

Q Well, without getting into all the technical aspects of it, can you do it in a way that can generally give me a picture?

A Okay, it's a track test and it involves putting high stresses on the tire in a manner that produces edge belt separation.

Q Did you ever do such a test on a tire manufactured by Kumho?

A No.

Q Did you ever do such a test on a Hercules tire?

A (Witness shakes head negatively.)

Q And specifically you haven't done such a test on any tire at issue in this case; its that correct?

A That is correct.

Q How would you control for the various potential causes of separation to isolate which is the [p. 26] cause in that cleavage test?

A Would you repeat your question, it was kind of –

Q Well, as I understand it there are a lot of potential different causes of separation; is that correct?

A That's correct.

Q And the test that you are describing, as I understand it, is designed to isolate a cause?

A No.

Q It's not. What is it designed to do?

A What it is designed to do is to cause the tire to fail by edge belt separation. Okay? So then you can change your design factors – I'm not talking about production problems or, you know, abuse factors but your design factors.

So you can change the rubber at the edge of the belts or the design of the edge of the belts or something like that and you have a reliable test to see if you have improved the tire. Okay?

Q So you would make the change and then test it again to see if it fares any better?

A Yes, you would make a change in a tire and we [p. 27] had a special construction group that built test tires and they tried to eliminate all the other production variables; in other words, they tried to build a perfect tire so we would get the best test quality. Okay. And you would eliminate all – you know, you wouldn't have problems with production. You know, you're not looking for that type of problem.

Q You're looking for design problems?

A Yes, exactly, just design problems.

Q So that test would not be able to isolate what abuse factors might cause separation?

A No, you could do other tests that did that. I mean it could be used for that.

Q Let's just talk about this test right now.

A You could use it for that and we did do a couple of tests at one time where we abused a tire and ran it to see it's separation resistance to see the effect of the abuse.

Q Tell me what you did to abuse the tire.

A They ran it at low pressure.

Q And what happened as far as separation?

A I don't recall.

Q Did the separation of the tire that was run at [p. 28] low air pressure occur more quickly or rapidly than on a tire that had not been abused?

A I don't recall. I seem to recall that there was some problem with the test. That we, you know, got some tires from someplace and we could not believe that the abuse that we saw was controlled enough to provide an accurate test.

Q So the test was unreliable?

A If I remember, that we had great doubt in the results.

Q So there was some uncertainty on whether you could rely on the conclusion that the test would point towards?

A If I recall, these tires were provided to us as abused tires and we could not believe that – we could not define the type of abuse in that case.

Q So there was some uncertainty as to the validity of the test?

A Yes.

Q Have you ever done a test, a cleavage test or cleavage test on a tire that's been abused that you found to be reliable?

A I don't recall one. That was not the basis of [p. 29] our – the thrust of our research.

Q Your research was aimed at design, as I understand it?

A Building a better tire.

Q And not at testing what abuse factors might lead to or cause separation?

A That's correct.

Q And it also was not aimed at determining what production problems or manufacturing problems might cause separation?

A That's correct.

Q I take it since you were working for Michelin the type of tires on which you did these cleavage tests were Michelin tires?

A Most of the time, yes, sir.

Q Occasionally you might test a competitor's tire; is that correct?

A We couldn't get them to run very long, so –

Q Well, is the answer to my question that occasionally you might test a competitor's tire?

A Yes, it was done occasionally, but everytime we did we found that Michelin was so far above the rest of

the industry that there was no point in testing the other tires.

• • •

[p. 30] Q Can you tell me the time frame of your tests of these tires?

A I worked at the track from approximately '82 to '87.

Q So after 1987 you haven't done any such tests?

A No. I've been involved in the forensic end.

Q Pardon me?

A I've been involved in forensics after that.

Q Since 1987 have you done any such tests?

A No.

Q Have you ever done such a test with respect to any litigation matter that you worked on?

A No.

Q Were there any other control failure simulation tests that you did that we haven't talked about yet other than this cleavage test.

A I did many tests. We had other tests that were similar to this in developing separation.

Q Tell me about those tests.

A Well, I can't tell you very much about it but [p. 31] they're very similar in that you stress the tire very heavy, you heat the tire through running and then you stress it in a way that produces edge belt separation.

Q And were those again aimed at isolating design factors that might improve the tire?

A Yes.

Q And they were not aimed at looking at production problems or abuse factors; is that correct?

A Well, the Michelin man would tell you that there's very few production problems in the Michelin plant, so that was not the basis of their research.

Q And the same goes for abuse factors, the tests that you did were not of tires that had been abused to see what result might happen when you subjected them to the stresses?

A We did other tests that –

Q Can we just stick to this one test right now?

A It was not specifically designed to test abuse factors.

Q Okay. What other controlled phase simulation tests did you do at Michelin?

A We did quite a few tests.

Q I want to know all of them.

[p. 32] A I was responsible for the truck tire adherence test program, truck and light truck.

Q Anything else?

A There were several other endurance tests that I did, mainly having to do with specific types of failures for truck tires.

Q Anything else?

A There were special tests that were done all the time.

Q What were these special tests?

A I'm talking mainly about the time at the test track. There were times – others that I'll have to talk about. Special tests might be a test that sometimes we did these that would test the abuse factors, like running a tire at low pressure to see the temperature. Also did temperature tests on the road. I did pavement studies. We did some ice and snow testing.

My first part at Michelin I did rolling resistance, cornering force and ozone endurance tests. When I was in tire design I did all types of tests having to do – I also did noise tests. When I was in tire design I requested all the tests that may be [p. 33] required to bring a new tire into production, and that involves hundreds of tests at times, everything from revolutions per mile to noise to handling to endurance.

Testing is generally divided into measurement and endurance type tests. Measurements, you measure some property of the tire, like rolling resistance or cornering force. And endurance, you see how the tire fails under controlled conditions.

Q Okay. Let me see if I can speed this along. It appears from your resume that you had three different general jobs while you were at Michelin –

A That's correct.

Q – is that correct?

Okay. You list five years in truck tires in adherence and endurance testing; is that where you started out?

A No, that was the last.

Q That was your last job. Your first job was one and a half years in machine tire testing; is that correct?

A That's correct.

Q What is machine tire testing?

A I did rolling resistance, cornering force and [p. 34] ozone resistance testing. I worked in a building that did all sorts of endurance testing.

Q And what is endurance testing?

A Well, there are many tests that are done in the automobile – I mean in the tire industry. Some of the Michelin tests are very similar to the DOT tests and tests that are done by other parts of the industry, which mainly is the road wheel test which you run at increasing speeds and see where and how your tire fails.

Q And when you say the DOT required tests, what tests are you talking about there?

A Well, there's a road wheel test that is mainly for truck tires, it's also done for other types of tires, but you run a tire at a certain speed for ten minutes and then you run it at an increased speed for ten minutes and then you increase it, it's either ten miles an hour or ten kilometers an hour. I think it's ten miles an hour in government tests, I get mixed up with the Michelin method.

But you essentially run the tire against the road wheel at a certain load and pressure and then you

increase the speed and hold it for ten minutes and you [p. 35] increase the speed again. And the speed at which it fails determines one measure of the tire's quality.

Q That gives it the speed rating?

A No, it's mainly used for – I don't know if you've heard of the tire quality system, but there's a temperature rating on tires and this is used mainly for that. Most tire companies use another method for speed rating although this is a good data for a speed rating.

Q In this one and a half years in machine tire testing, did you test any passenger tires?

A I was involved – they were not specifically my tests but I was there and I reviewed the results.

Q Well, did you participate in any machine tire tests of passenger tires?

A Yes.

Q And what was your involvement?

A I was one of the engineers that assured tire quality.

Q What did you specifically do in those tests?

A Okay, specifically on those tests I was a reviewer. They were not specifically my tests to guarantee the quality. Michelin has engineers that are responsible for each test and they are in charge of [p. 36] maintaining what is called test quality. In other words, keeping your dispersions low and making sure the test was run correctly.

And I had three tests that I was specifically involved with, but I reviewed the results of the other engineers' tests and they were responsible for the other tests. These machine –

Q They were responsible for the passenger tire tests?

A The passenger tire speed tests. I did the passenger tire rolling resistance, cornering force and ozone test.

Q And these were used for purposes of getting the various quality ratings; is that correct?

A They were used for that and mainly as a test to improve the quality of the tire. Similar to the other types of tests I've described.

Q They were mainly focused at design improvements?

A Design improvements, yes.

[p. 37] Q Were these tests that you were involved in when you did machine tire testing during the first one and a half years at Michelin, tests that were designed to test how well a tire that had been abused would perform under certain conditions?

A There were tests that were done for that. See –

Q Let me stop you right there. Can you tell me about those tests? What tests did you do in that regard?

A There were many, many tests that were done, that were instigated by designers. All testing gives you an

idea of how sensitive your tire is to any production variances. Okay.

So the tire designer is always aware that, you know, certain production problems can cause a variation in test results. And a great deal of work is done with production tires at times to see what the variation is [p. 38] in the production plants. I was involved in some of that.

Q Was that of passenger car tires?

A Generally passenger and light truck, yes.

Q And what was your specific role in those tests?

A Well, when I was in testing I did some of the tests and evaluated the tests. When I was in tire design I took – I took several production tires and tested them to see the variance and I set up a program that was a periodic test of production tires.

Q To monitor quality?

A Monitor quality, yes, sir.

Q During the first one and a half years when you did the machine tire testing you stated that you did some tests of tires that had been abused; did I state that correctly?

A Yes.

Q What test did you do of tires that had been abused?

A I know that there were many programs that were set up and as I said, every test does give some idea of resistance to abuse. In other words, you know, a tire [p.

39] that is overloaded, of course, you can tell by these other tests how well, you know, almost all testing is done.

All endurance testing is done at conditions that are much more severe than the use of the customer because you have to wear out a tire and cause it to fail much quicker. And one of the challenges of testing, of course, is to provide an economical test which means you wear your tire out faster but have it relevant to what happens on the road.

Q But what I'm interested in is you stated that you did testing –

A Yes.

Q – during your first one and a half years at Michelin –

A Uh-huh.

Q – of tires that had been abused.

A Uh-huh.

Q Is that correct?

A Well –

Q Let me finish.

A Okay.

Q Is that correct, did you do that type of test?

[p. 40] A There's two types of – okay, what I'm trying to say, there's deliberate abuse and then testing under certain types of parameters. Okay. That is not done that much.

Q But let me ask the question here. As I understand what you're saying is you can create conditions in your test that are more severe than conditions that are normally experienced on the roadway?

A That's correct.

Q And you did those tests?

A Yes.

Q I'm talking about where a tire had been abused before the test and then you tested it to see what happened to it.

A There were many programs where it was done by designers or whatever to test that. They would run a tire underinflated or something like that and then make various measurement tests or endurance tests.

Q Did you ever do that?

A I was involved in some parts of those.

Q What was your role?

A Most of the tests that are done like that, I [p. 41] ran the test.

Q When you say you ran the test, what do you mean?

A It means I was in charge of test quality.

Q That means you were trying to make sure the test was accurate?

A Yes.

Q And what did you do to make sure it was accurate?

A Well, I wrote procedures and made sure that the workers followed those procedures. I examined the tires to make sure that there was nothing abnormal in their failure or the failure mode or the measurement mode.

Michelin has this system where each test is monitored by an engineer who is responsible for what we call test quality. And they do everything, except we're not direct supervisors of the workers. We had another guy that did that.

But we did everything. We maintained the machines in order that the workers did their job correctly, that had good procedure, and then we analyzed the statistics to make sure there was nothing [p. 42] abnormal on the test.

Q Did you ever perform machine tire testing of any Kumho tire or Hercules tire?

A Not specifically. I remember them coming through, I did some rolling resistance tests on those.

Q But did you do any that dealt with abuse?

A I'm sure they did but I don't recall the results.

Q Well, did you have any involvement in that?

A No.

Q And as I understand it, these machine tire tests that you performed during your first one and a half years with Michelin were, again, focused on the design phase of the tire, you were using the test results to see how you could improve design; is that correct?

A That's generally correct, yes, sir.

• • •

[p. 45] Q You mentioned that you did the rolling resistance test or that there was some vague [p. 46] recollection on your part that there was a rolling resistance test of a Kumho or Hercules tire. Can you recall anything specifically about that?

A No.

Q Did you ever do a cornering force test on a Kumho or Hercules tire?

A I don't think so.

Q Did you ever do an ozone test on a Kumho or Hercules tire?

A No, sir.

Q Going back to the rolling resistance test, do you remember if the rolling resistance test was on a Hercules tire as opposed to a Kumho tire?

A I recall a Hercules more than a Kumho. I don't – I don't even know if Kumho was imported at that time. But I do seem to recall the Hercules but it's not a very specific recollection.

Q So you're not even sure you tested a Hercules?

A I'm not positive. It was, what, 16 years ago, something like that, so – we tested thousands of tires.

Q Well, we're interested in what you can remember to be true because this is a court of law [p. 47] and –

A Right.

Q – the testimony you give has to be based on your ability to swear that what you're saying is the truth.

A Okay.

Q Can you say within that standard that you tested a Hercules tire?

A I believe that I tested a Hercules tire.

Q But you're not sure?

A But I can't be positive.

Q And you're not sure, as I understand it, and don't have any specific recollection about whether you did a rolling resistance test on a Kumho tire?

A I am definite that I did not.

Q Then you don't know whether the Hercules tire that you have some feeling that may have been tested was manufactured by Kumho or any other company?

A I did not check that.

Q As I understand it your next progression with Michelin involved truck tire design?

A Yes, sir, light truck also.

Q And you spent approximately four years in that [p. 48] position?

A Yes.

Q What years were those?

A Probably somewhere around '78 to '82.

Q What was your specific role in truck tire design?

A Well, I did light truck and truck tire. I developed the – I helped develop the LT series of light truck tires. And I developed many tread designs and tires in the pilot. And I worked on the XDA tread pattern, the XM plus S4, the XDL and there's one other. There are several others.

But I worked specifically on pilot sizes and regular sizes. I did some work on the double-wides and I did some recapping work toward the end.

* * *

[p. 49] Q Do you hold any patents at all?

A I don't know, that was a different department. Some of the work – I think Michelin patented some of the tires I did but I was not involved with that.

Q Is your name on any patent to your knowledge?

A Not that I know of.

Q Did any other people have their names on patents on tires that you worked on?

A I know of one case, Daniel Giron had a patent in France and he was allowed to have his name on that.

Q Do you know whether or not that was a tire that you helped design?

A It was a tire that I helped work on – I worked on in the U.S. to help fine tune the design for the U.S. but at his direction.

Q And you don't have any dispute with that being his tire design?

A I don't know how that came to be. Michelin is very mysterious in some ways.

[p. 50] Q These tires that you worked on during these four years were all, as I understand it, truck tires or light tuck tires?

A They were, yes.

Q What is a truck tire as opposed to a light truck tire?

A Okay, there's three general classes of tires: passenger, light truck and heavy truck. Okay.

Q Or truck? The last one is sometimes just called truck tire?

A Right, that would be called a truck tire. We called them heavy truck because in the French our department is called the polourd department which means heavyweight. And cammionette is the light truck tire.

A passenger tire is like a 14- 15- or 16-inch tire. Back then it was just up to 15 inch but now there are 16 and even 17-inch tires and some 18-inch performance tires.

But the light truck is kind of a mixing between the passenger and the truck tires. It's mainly either 15-inch or 16-inch tires or 16.5-inch tires. And they were used on – first on commercial vehicles, like UPS trucks, and then of course we have pickup [p. 51] trucks which use these also.

And the LT series for Michelin was kind of an area where they went from – before, they had used mainly truck tire principles to design their light truck tires. And

they were using passenger tire principles to design the new light truck tires. And I was there during that time.

Heavy truck tires, like your 11R225 or your pilot sizes, like a 275ADR225 or 245.

Q Heavy truck tires are for what types of vehicles?

A Class eight, class seven.

Q What are those types of vehicles?

A Semis, like you see on the road.

Q Dump trucks or –

A Dump trucks.

Q – big delivery-type trucks?

A Dump trucks are not class eight usually but class eight is a semi, 18-wheeler, whatever you call it, you know, like you see on the road.

Q You talked about 15 inch, 16 inch, et cetera. When you use that inch measurement, what measurement on the tire is that?

[p. 52] A That is the rim diameter.

Q And there is a difference between truck tire design principles and passenger tire design principles?

A Yes, there is.

Q And that's due to the different use of the tires?

A Yes, different pressures.

Q What pressures typically are in passenger tires?

A 35 PSI.

Q And what in truck tires?

A Around a hundred.

Q What about light truck?

A They run from 35 to about 80.

Q And the performance and operation of those types of tires would be different than the passenger [p. 53] car tires because of the difference in air pressure?

A There's a slight difference because of the load that's put on there but the principles of the new light truck tires are just the same as passenger tires.

Q With the exception of the pressure in the tire being different?

A Yes, and you have to design the tire for slightly higher load sometimes. Some of the heavier passenger tires have a very high load rating.

Q What was your specific involvement in these tires? It sounds like from your earlier answer you were involved mainly in the tread design; is that correct?

A No, we were responsible for the whole part of the tire. We had to either make modifications to existing tires or we created new tires from scratch.

Q And so that would have included everything from the inner-liner out to the tread?

A Right, bead design, tread design, belt design.

Q Did any of the tires that you designed have a – or worked in designing, have any type of belt edge ply or strip?

A We were starting to look at doing that. We [p. 54] had built some tires with an end cap.

Q And can you define an end cap for me?

A What is usually used, like in this subject tire, is a zero degree nylon belt across the edge of the belts.

Q What is the purpose of that?

A To reduce separation.

Q How does that reduce separation?

A Well, the original theory was that by using nylon – nylon has a unique characteristic in that as you heat it, it contracts. So the theory was that as the tire heated up due to use, that this nylon belt over the edge contracted, stabilizing the edge of the belts.

The edge of the belt is the critical element in designing a radial – steel belted radial. And a lot of companies have had trouble with separations and there was an attempt to reduce separation. I mean to reduce separations.

Q Did any of the tires that you worked on end up having any reinforcement of any type along the belt edge?

A That was done in the passenger department [p. 55] while I was there.

* * *

Q Did you actually participate in building any tires?

A Yes.

Q Have you ever personally built a tire?

[p. 56] A Yeah.

Q What type of tire did you build?

A I believe it was an 11R225 truck tire.

Q Is that the only type that you built?

A That's all I recall. I think I did a light truck one time but I can't recall it specifically.

Q And that wasn't a passenger tire?

A Well, it was similar but it's not a passenger tire, no.

Q During the four years that you were in truck tire design did you do any control failure simulation testing?

A I requested quite of a bit of it, yes.

Q Did you perform any of it yourself?

A No, I had it done by other people.

Q And the tests that you ordered were to assist you in the design process?

A That's correct.

* * *

[p. 57] Q – by itself on one side of the car as opposed to a tandem, two tires side by side?

A Yeah, I don't want to use the word car because it's a truck.

Q Or truck, yeah.

A Trucks use dual mount tires and we wanted to see – we had a request by somebody to see, if they only carried one tire as a spare, how far would they get under normal loads. You know, it was a trucking company that we did work with and they asked this question. And we did the test and I forgot what the [p. 58] answer was, but –

Q So that's where if you had both tires fail on the double mount could they get by with just one spare replacing it; is that what you were studying?

A Generally, yes.

Q And that would create, I guess, an overload to that particular tire?

A Yes, it could.

Q What were the results of the test; do you remember?

A I don't recall. I believe that we found that if they used a Michelin tire they had a pretty good – they had a good margin to make 50 miles or so. They could make 50 miles on a Michelin tire.

Q And this would have been a tire that was brand new?

A Yes.

Q Could they go longer than 50 miles?

A If I recall they could go a lot farther but we didn't want to tell them that they could go much farther than that.

Q What would be the cause of tire failure of that overloaded tire when it did fail; do you recall?

[p. 59] A Generally in that type of situation the Michelin tire would fail in the tread area.

Q What was the failure?

A It would have – it would lose its tread.

Q Tread separation?

A Yes, a tread separation as opposed to a belt edge separation, okay.

Q What's the difference between a tread separation and a belt edge separation?

A A belt edge separation generally starts between the two steel belts and progresses to where you lose the tread and the outer belt. As what happened in this case.

A tread separation, the tread comes apart from the outer belt. It's quite a bit more rare type of separation.

Q And what's the cause of a tread separation?

A Generally it's a manufacturing defect but it can be caused by abuse.

Q Did you reach any conclusion as to whether the tread separation that occurred in this Michelin tire that you worked on and tested was the result of a manufacturing defect or an abuse defect?

[p. 60] A It wasn't a manufacturing defect.

Q How did you isolate that?

A Because we have tested a lot of tires and we know when and how it fails.

Q We'll get into that a little bit more later. But other than just saying you know when and how it fails, were there any objective criteria that you look at that point to how the tire failed?

A Well, when you're in a testing procedure you can quantify things that you can't do out in the field sometimes. So you know how your tire works, you become intimately aware of how the tire fails.

Q And that would be in the controlled environment of the laboratory; is that correct?

A Yes.

Q And in the field there's a lot more uncertainty as to what would cause a tire to fail; is that correct?

A Well, there can be, yes.

Q And that's because there are more variables in the field you can't control?

A But generally there are a lot of indicators that can tell you exactly what happens.

[p. 61] Q But would you agree there are a lot of variables out in the field that you can't control and that makes determination of the failure of a tire that fails in the field more difficult and uncertain?

A I think that on the test track you can eliminate a lot of variables by, you know, measuring these things.

* * *

[p. 68] A When you're designing a tire, the temperature that a tire runs at is very important to your design.

[p. 69] Q Why is that important?

A Because that is a measure of its endurance, how long it will last. And –

Q Why is heat so important?

A Because it deteriorates the products.

Q What product?

A Well, any of the rubber products.

Q So heat is the enemy of rubber?

A That's right.

Q And you agree that heat can deteriorate a rubber product?

A Absolutely. And so every tire design that I came up with, we did temperature tests. Okay. We ran these under various conditions, loads, pressures, speeds, everything, and we looked at the temperature, the internal temperature of the tire, to see that if I had the design right.

Q And you were trying to get a tire design that would result in a lower temperature as opposed to a higher temperature?

A We were trying to make sure that there was not a dangerous temperature in the tire.

Q What is a dangerous temperature in the tire?

[p. 70] A Well, we had certain limits and I don't think I can tell you those, but say X number –

Q Go ahead.

A Say some number of temperature.

Q Are there any generally accepted ranges of temperature in the tire design and production field that would constitute dangerous temperatures?

A There are – that's a complicated, technical question. Okay. I'll try to explain this. When you're designing a truck tire which is designed to go through three lives of tread, you know, the original life, and two recaps, or whatever, the temperature is very important. Okay. Every degree that you have under steady state conditions at normal running, every increase in a degree or so will affect that on a statistical base.

Q Will affect what?

A The life of the casing.

Q And by the casing you're talking about what?

A The body of the truck.

Q The structure of the tire?

A Yeah. Truck tires are designed differently than passenger cars. Okay. You've got a passenger [p. 71] tire here. Truck tiers are designed to go through three lives, at least. We had some Michelin tires that went over a million miles. Okay.

And – but there is two considerations. One is your temperature and whether you can improve it by changing

the structure of the tire by a degree or two. And if there is a threshold, a limit of the temperature, that you cannot put the tire out for any reason if it is over that temperature.

In other words, there's a no-no level here. And then beyond that you can change things to improve it incrementally. Now that's just one factor in the tire life.

Q Let me stop you right there. What you're saying is there's a temperature level above which –

A That's correct.

Q – you don't want to go because that will destroy the tire?

A That's correct.

Q My question is what is that temperature level? Is there an accepted temperature level within the tire industry –

A No.

[p. 72] Q – above which you don't want to go?

A No, there isn't one number.

Q It depends on the tire?

A It depends on the quality of the rubbers. Rubbers all have a different problem, I mean, you know threshold temperature. They all have different stressing due to the design of the tire. And this is more or less theoretical, if you would, in a consideration for a passenger tire because passenger tires, you know, should not have a separation during their first life.

Q Well, for a passenger tire, is there a temperature level that's accepted in the industry above which you don't want to go?

A I assume that there is.

Q Do you know what that is?

A No, I don't.

Q As I understand it, the temperature tolerance of any particular tire depends on the rubber chemical formula that's used?

A That's right.

Q As well as the tire design?

A That's correct.

• • •

[p. 74] Q So any passenger tire, regardless of whatever abuse it goes through, should never have a belt separation or tread separation?

A No, it's a complicated, technical question. So that –

Q Wait a minute, let me make sure I understand this. Is it or is it not true that any passenger car tire, regardless of the abuse it goes through, should not experience a tread or belt separation?

A I think that tires should not go through, with normal usage, It should not have a separation through normal usage which involves some abuse, if you want to define abuse in certain ways. Okay.

Some tire companies think that if you hit a rock, that's an abuse. But you have to design the tire to withstand that abuse. A tire should not fly apart if it's overloaded for a minute or two, you know, or when it goes right beyond the load inflation table it should not fly apart immediately after that.

[p. 75] You know, it should be able to withstand high speed for a short – for a minute or two. For short periods of time. So the definition of abuse is very difficult.

Q Well, say you have continuous abuse, i.e., under your definition, running the tire at high speed for a long period of time. Would you consider that to be abuse?

* * *

A You'd have to define, you know, the speed and the load and the conditions.

Q Well, above the speed that the tire was designed to go. At a high speed or higher than the design speed –

A You can certainly –

Q Let me finish.

A Okay.

Q Let me start over on the question, I think we got a little bit convoluted here. As I understand your definition of abuse, abuse would constitute subjecting the tire to forces for more than a minute or two that [p. 76] the tire is not designed to be subjected to; is that abuse?

A That's a general definition of abuse, yes.

Q And if a tire is designed to be run at a certain air pressure, if a person were to drive that tire, operate that

tire, below that air pressure for more than a couple of minutes, that would constitute abuse?

A It could be, yes.

Q You say it could be. What factors would go into whether it is or it is not?

A The degree

Q What degree would constitute abuse in your opinion?

A Well, what I'm trying to say is that the general idea of abuse of a tire as defined among the industry is that you operate a tire below the load inflation curve.

Q What is the load inflation curve?

A Well, this says that if you have a certain pressure in the tire, the tire has a certain load rating. In other words, this is a P205 –

Q Let's not talk about this tire yet, I'll get [p. 77] to that in a second. We're talking generalities here.

A You have a certain load that the tire will withstand and operate at a certain pressure. Okay. If you cut the pressure in half, it can carry only half of the load, approximately. It's not exactly but – in other words, there's a curve. At each pressure there's a certain load. Okay.

Now that is a line and generally it's considered that if you're below the line you have abused the tire. Now the tire shouldn't fall apart immediately if it goes below the line for a couple of minutes, you know, or even a couple of days or whatever. It depends on how far below you

are, how far below the line you are, whether a tire has been significantly abused.

* * *

[p. 78] BY MR. BABINGTON:

Q I want to focus now on the five years listed in your resume that you were involved in truck tire adherence and endurance testing while at Michelin. Do you remember what years those were?

A I believe '82 to '87 approximately.

Q And what do you mean by tire adherence and endurance testing?

A We had – we were measuring the braking force [p. 79] of a tire.

Q How long it takes the tire to slow down when you apply the brakes?

A Essentially, yeah.

Q So that's concerned with co-efficient of friction of that tire as opposed to the various different pavement interfaces?

A Exactly, water situations.

Q What was your specific role in those tests?

A I was responsible for test quality. I did machine studies, tire studies and pavement studies.

Q To try to make sure that all the necessary controls were in place, that you got accurate and valid test results?

A That's right.

Q What type of tires did you test?

A Truck and light truck tires.

Q Did you test any passenger tires?

A They were being tested at the place.

Q Did you test them?

A I did at times, but that was not my specific role.

Q Did you ever test any, in this phase, did you [p. 80] ever test any Hercules tires?

A I don't specifically recall –

Q Did you during this –

A – that I did.

Q – phase, this five years, '82 to '87, did you ever test any Kumho manufactured tires?

A I don't recall.

Q Can you describe for me how you conduct a tire adherence and endurance test?

A Well, we have machines that run the tire at a certain load and pressure and then they go through a braking cycle on a test track and the forces are measured.

Q So this was actually done on a track as opposed to in the laboratory on a dynamometer?

A Oh, yes.

Q And what were you measuring?

A The – essentially the co-efficient of friction of the tire.

Q What different variables did you change to see how the tire reacted under those variables?

A The majority of the test involved either the tread design or the tread rubber.

[p. 81] Q And then I guess you tested it on different types of pavement as well?

A Exactly.

Q And different types of pavement wetness, you know, very wet as opposed to –

A Yes.

Q – dry, that sort of thing?

A Yes.

Q During this phase, these five years, did you do any overload tests?

A The tire – the adherence was measured at different loads, yes.

Q Were any of the loads overload situations for the particular tire at that air pressure?

A Some of them were but mostly not.

Q And again the purpose of that test was not to see whether the tire failed at that overload but to see how it affected the co-efficient of friction and the braking distance of that tire under those specific circumstances?

A Yes.

Q And was all this again used primarily for the purpose of design input?

[p. 82] A Yes,

* * *

[p. 84] Q Depending upon the tread depth?

A Depending upon the tread depth. And yet the cut-off line that the industry has decided is $^{2}/_{32}$ of an inch?

A That's right.

Q Is that for all types of tire, truck, light truck and passenger?

A The Feds have designated $^{2}/_{32}$ as the minimum for truck tires on drive and trailer axles but $^{4}/_{32}$ for steering axles.

Q And that's for trucks?

A For truck tires only.

Q What about for passenger?

[p. 85] A Passenger, the only thing the Feds say in the Federal Code of Regulations is that you put wear bars that are $^{2}/_{32}$ thick. They allow the states to write a law saying that the tire is illegal if it is used below $^{2}/_{32}$, and only about half the states in the U.S. have any type of regulation on the books talking about tread depth of passenger tires.

Q Do you know whether Alabama is one such state?

A As far as I know Alabama is a state that has that but it is not enforced in any state rigorously except that if you have an accident and someone sees a bald tire, they will write you up for it.

Q Do you know what Alabama's specific regulation or law in that regard says?

A It's been – I do not know the specific language.

Q What is you general understanding of what it says?

A Well, there's several ways of defining it. Truck tires use the language saying that if any tread groove is below 2/32, then the tire shall not be used.

Passenger sometimes have where they say if you measure it at like 12 points and a certain percentage [p. 86] of those are below it – I don't know what Alabama's language is specifically.

* * *

[p. 88] Q. And then you say that you installed and verified light truck tire tests hub in vehicle.

A Yes.

Q What are you talking about there?

A We had a machine that had hubs. It was essentially a semi-trailer that had positions in the center of it, a hub, an instrumented hub, or three of them, that would load a tire up in the center and it would do the braking test or temperature test.

And when I got the machine it didn't have the light hub – light tire – light truck tire test hub and I put that in and verified it.

Q So that was again dealing with the tire adherence and endurance testing?

A That's mainly adherence.

[p. 89] Q You wanted to make certain that any tires tested on that hub, in using that equipment, would produce results that were accurate; is that correct?

A That's right, yes. You have variation in all processes and we're trying to reduce the machine variation to a minimum.

Q And those variations in the machine processes and in machines would also apply to various automobiles and cars on which tires are installed; is that correct?

A Yeah.

Q And obviously when a tire is installed on those in the real world you can't control those variations; the tire manufacturer cannot.

A Of course not.

Q And those can all affect how a tire performs and the conditions to which it's subjected in the real world?

A Sure.

Q. Your last sentence in that five-year period of Michelin states that you taught SPC course to engineers and operator.

A. Yes, sir.

Q. What are you talking about there?

[p. 90] A. SPC stands for statistical process control.

Q. What is that?

A. It's a method of statistics that is used by – it was used by the Japanese to improve their quality after World War II. It was taught by an American, I can't remember his name, Denning – Demming, who died last year, I believe. One of the great engineers in our history.

And he taught them how to improve their processes using SPC techniques and that's the reason their quality was so high in the '80s compared to the U.S. automotive products.

Q. So this is a quality control method; is that correct?

A. Yeah, it's a statistical method of maintaining quality in a process.

Q. Did Michelin follow that?

A. They tried, yes, sir.

* * *

[p. 92] Q And then once a tire failed what did you do to follow up on the test?

A Well, sometimes the tire was cut so that I could evaluate the test. The cleavage test which developed belt edge separation, we tried to stop right before the tread came off. And then we took the tire to another department that cut it apart and then we could look at that after it had been decorticated.

Q How could you tell that the belt edge was about to come off so that you could stop the test?

A My drivers were trained to develop – to sense a certain type of vibration that occurred right immediately before the tread came off.

Q Is there any other indication or physical signal that's transmitted from the tire to the vehicle that can be picked up by a driver before a belt or tread separates?

A Yes.

Q And what is that?

[p. 93] A The – the tire felt oily.

Q What does that mean?

A It means it had less lateral force, it felt squirrelly.

Q When you say less lateral force –

A Yes.

Q – you're talking about –

A You're going around a corner and it feels slippery.

Q Side to side?

A Yeah.

Q Anything else?

A Well, there are visual indications.

Q What are those?

A You see the tread lift up.

Q Bubbles?

A Yes, right before it comes off.

Q Anything else?

A Those are the major ones.

Q Is there any change in the noise level of the tire?

A Not on a truck tire.

Q Well, in the test you were doing with truck [p. 94] tires –

A Yes.

Q – would the same statements be true of passenger tires?

A Pretty much.

Q What would the differences be?

A The differences are that truck tires, once it starts it proceeds much more rapidly than a passenger tire.

Q So a passenger tire would take a longer period of time –

A Somewhat –

Q – to develop a separation?

A – longer time, yes.

* * *

[p. 98] Q Also I think you said that there was some physical appearance differences in a tire that had a tread separation going on as opposed to one that did not?

A Yes.

Q Is that true with passenger tires as well?

A Yes.

Q What would those physical appearance [p. 99] differences be?

A You have a lifting of the tread. In other words, the tread, particularly when it's hot, will have a different appearance. And this can be shown – there's two physical appearances. One is a lifting of the tread, which I find very hard to see but there are tests you can do to find – find that. I refer you to the recapper's manual, how they do it, how they test it when they're about to recap a tire. And there also can be abnormal wear.

Q And abnormal wear being what?

A Generally under a separation the tire will wear faster than in other places. You will have wear that is uneven around the tire or you can have one side of the tire worn faster than the other.

* * *

[p. 100] Q Do you have any knowledge or experience – well, I know you have experience, but do you have any knowledge about the tests required under the United States federal regulations to be conducted on tires?

A The CFR 49?

Q Yes. Are those the only ones you are aware of?

A The only ones I recall right now. I have to go through the book every now and then to refresh my memory.

Q Are those the tests that are sometime called the Section 109 test?

A Yeah, DOT 109, used to be call.

Q Other than the DOT 109 test, are you aware of any tests that are required of manufacturers of tires?

A I'm not sure which segments these things are in anymore because as far as I know the DOT 109 was incorporated into CFR 49.

But the test generally, there used to be a plunger test, there used to be a bead seating test, there used to be a – and then there's the three tests that do with the – the uniform quality grading system, [p. 101] which is one is the temperature test, the traction test and the wear test.

The temperature test is the, as I mentioned before, is an old test that has been incorporated in the tire quality grading system.

Q Do you consider yourself to be an expert in that area as to current regulations?

A I do not remember the exact things so – I know what they do and I know what they are and I know more than the average person about it, so – and I've done these tests, you know, most of the tests I've been involved with, the development of some of the tests within my company. So, yes, I think I'm an expert on it. But I can't tell you the exact test method right now without going back to my book on some of these.

* * *

[p. 103] Q As I understand your experience in this area, you don't have any experience with doing the

mechanics of registering and stamping the DOT number and all that on there, rather your experience with these DOT requirements of these various tests is in having had [p. 104] performed them when you were with Michelin; is that correct?

A That's correct.

Q And so when you say you hold yourself out as an expert in this area, you're saying that you've done these tests before and you can look it up in the book, even though you don't remember the specifics of it right now, you could look them up in the book and you could go out there and set up a test procedure to accomplish what's required; is that correct?

A Yes.

* * *

[p. 105] Q Are there any, beyond the requirements of the federal government, are there any industry standards in the United States tire industry that are suggested with [p. 106] respect to testing of tires?

A Well, I don't know of any besides the size test, you know.

Q What is the size test?

A Well, there is a standard that is put out by the Tire and Rim Association that gives load inflation tables and size tables. In other words, there's a certain tolerance, if you put out a P205/75R14 or something like that, then there's a certain size requirement and a tolerance for that size.

Q And this is a standard published by the Tire and Rim Association?

A Yes.

Q Do you know what that specific standard is?

A I have some copies of it in my file and I have many of their books.

Q Are there any other standards put out by the Tire and Rim Association with respect to testing of tires?

A The Tire and Rim Association just puts out a standard that the tire, as I understand, the tire people certify that their tire will meet this load-carrying capacity. What – there's two purposes, [p. 107] two general purposes for the Tire and Rim Association; that is, if you have a certain tire size like a P205, you get a tire of a certain size and a tire that carries a certain load at a certain pressure.

Q So those are the only two standards that you're aware of put out by the Tire and Rim Association?

A Those are the only ones I'm really familiar with.

Q And the first such standard is that if you label your tire a certain size tire, it needs to meet certain dimensional criteria so you can match it up with a rim or whatever that's appropriate for that size tire?

A That's correct.

Q And the second such standard deals with the load-carrying capacity of a tire; if you have a tire that is of a certain dimension or type then the load-carrying capacity should be within these minimum limits?

A That's right.

Q Let me ask this, this may be a way to eliminate this whole line. Are you making any [p. 108] criticism at all of the tire at issue in this case, the Kumho Superior XII that was on the accident vehicle with respect to any of these Tire and Rim Association standards that you've just mentioned?

A No.

Q So you don't believe that's an issue in this case?

A No, not directly.

Q Well, you said not directly; what do you mean by not directly?

A Well, I don't – I can't eliminate a certain design problem in my analysis of the tire. And that may affect whether this one certifying it, but I cannot determine whether it is certifiable by the Tire and Rim Association. So no, the answer is no.

Q So the answer to the question of whether you have any criticism of the tire at issue in this case with respect to failure to meet the Tire and Rim Association standard is that no, you do not have any criticism of the tire at issue in this case under those standards?

A That's correct.

Q Since you have been involved in litigation [p. 109] support or consulting, which I understand started when you went to work with SEA in 1987; is that correct?

A That's correct.

Q Have you ever done any controlled failure simulation testing of tires?

A No.

Q So the last time you did any controlled failure simulation testing of tires was when you were with Michelin?

A That's correct.

Q Have you done any testing of tires since you left Michelin?

A I have done some testing, yes.

Q What tests have you done since you left Michelin?

A Well, primarily I did a study of the leakage through nail holes of tires.

Q Was that test for a particular lawsuit?

A Those tests were, yes, sir. I've done it several times. And there have been many leakage tests with bad rims that I've done.

* * *

[p. 110] Q What is the purpose of the nail hole leakage test?

A I've had several tires that have had nail holes or improper patches and I was trying to determine the amount of leakage. And I've had several tires that had rims that for some reason did not leak, and testing the leakage across the bead if there was bead damage.

Q In the nail hole leakage test what you're trying to do is quantify the amount of air that escapes from the tire in a given period of time?

A Yes.

Q In the other leakage test where you were looking at the bead rim interface, you were trying to determine the quantity of air that leaked from that point of the tire during a certain period of time?

A First determine if it leaked and secondly to quantify it.

Q How would you go about doing a nail hole leakage test as you described it?

[p. 111] A You inflate the tire. You come back a week later in time, you know, measure the pressure and then come back a week later and see the pressure.

Q So you determine the amount of air that's escaped by measuring the internal pressure of the tire?

A Yes.

Q How can you use that to reach a quantity of air that's escaped?

A Well, you just – the quantity of air that has escaped is really not the number you're asking for, it's the reduction of pressure. Unfortunately there's a lot of accidents that occur because there are nail holes that cause slow leaks and people don't notice it. And five or six weeks later – you know, they may be putting air in every month or something like that and then they change their conditions or the leakage increases and they get out and they have a problem.

The last case I had, we had two kids die because they were coming back and the tire on the back had gone to a low pressure and they had a lane change and they essentially lost control and overturned and perished.

Q So nail hole leakage is a dangerous thing for [p. 112] a tire?

A Can be.

Q Under what circumstances can it be?

A Well, if the –

MR. JACKSON: Did you say can or can't?

MR. BABINGTON: Can.

THE WITNESS: Can. Okay, tubeless tires are remarkably resistant to losing air pressure compared to tube type tires. So you can have a slow leak and people may add air every month or something like that and then they may forget it or something like that and it goes down to below the line on the load inflation table or it just makes the handling squirrelly.

* * *

[p. 113] Q Let me ask you this, do you agree that even a nail hole that appears to be patched correctly can still leak? I mean visually you can't always determine if a patch leaks or not.

A I think you can.

Q Just by looking at the patch?

A Just by testing the patch. Looking at the patch and determining whether it's still stuck around the edges.

Q And that visual test of just looking at the patch is a hundred percent reliable in your opinion?

A Well, that and other indications.

Q What are the other indications?

A Well, if you're trying to blame the nail hole on a separation there would be polishing around the nail hole to show that the leakage did cause the separation.

* * *

[p. 115] Q You haven't done any of those types of tests that you just described, deceleration test or the handling test, in this particular case?

A Oh, no.

* * *

[p. 116] BY MR. BABINGTON:

Q. I want to talk about now your time at SEA.

A. Yes, sir.

Q. As I understand what SEA is, it's a consulting firm that does litigation support and litigation consulting services?

A. Some of what they do is that. Most of what they do is that, yes, sir.

Q. And that is what you did while you were there; is that right?

A. Yes, sir.

Q. How many times have you testified in court would you say?

A. Approximately 18.

Q. And how many –

[p. 117] MR. HERLONG: 18?

THE WITNESS: 18.

BY MR. BABINGTON:

Q. And how many times have you testified in deposition?

A. Approximately 35.

Q. And were most of those while you were with SEA?

A. Yes.

Q. All the times that you've testified in deposition or in court, have those been as an expert witness?

A. Yes.

Q. What areas of specialty have you held yourself out as a specialist in?

A. I do vehicle – vehicular accident reconstruction. I do examinations of brakes and steering systems. I've done heating equipment.

Q. Heating as related to a car or –

A. Mainly house heating and factory heating systems. Generally we have the vehicle accident reconstruction, the tire failure analysis and other questions having to do with design or failure analysis, [p. 118] as the result of being a mechanical engineer. That's just general topics. instead of listing specifically, we'll start with the general.

Q. In your resume here under SEA you state background in tire design, tire testing, vehicular brakes, statistical analysis, polymer plants, oil field equipment, liquid and natural gas equipment and machine design.

A. Yes.

Q. Are those all areas in which you've testified or held yourself out as an expert?

A. I've not testified in some of those areas yet.

Q. Have you held yourself out as an expert in those areas?

A. Yes.

* * *

[p. 124] Q. Was the work that you did while you were at SEA primarily for the defendant or the company whose [p. 125] product was under attack or was it for the plaintiff?

A. I did some of both, but I would say it was probably mostly defendant – defense work. I represented several companies, auto companies and manufacturing companies in certain cases.

Q. What companies were those that you represented?

A. American Honda, General Tire, J.T. Tire. I've worked for Ford. I've worked for several Toyota dealers. I've worked against Mazda, a Mazda dealer. I've worked against a – can't remember.

Q. But lots of different manufacturers?

A. Yes.

Q. Can you give me a ratio percentage wise of how much of your work at SEA was for defendant as opposed to plaintiff?

A. I don't keep statistics on that and – but I think that more than 50 percent was what you would call defense work.

* * *

[p. 129] Q Has most of the work that you've done since you've gone to work for George R. Edwards, Inc. been in the area of tire failure analysis or tire design as opposed to accident reconstruction?

A Yes.

Q Can you quantify the percentage that is tire related as opposed to accident reconstruction related?

A It would probably have to be 95 percent, probably.

Q 95 percent tires?

A Yes.

Q And of that 95 percent that's related to tires how much of that is where George R. Edwards, Inc. is employed by the plaintiff?

[p. 130] A I think it's all of them that I've worked on.

Q You seem to have gone from a firm that worked predominantly for the defendant to one that now works predominantly for the plaintiff; is there any reason for the switch?

A No reason for it except that tire companies, when you work for the plaintiff once, you don't work for tire companies anymore. So you have to choose a path or one way or the other.

Q Why did you choose the plaintiffs' side?

A Well, I had done some plaintiff work and I don't think I was going to get any – the main reason I'm going with George Edwards is I kind of want to work for myself. So I think that, you know, I want to work with George Edwards and I want to work for myself after he retires.

Q Has he indicated he's going to retire?

A Well, he thinks he wants to but I don't think he'll ever do it.

Q You said that once you worked against a tire manufacturer that other tire manufacturers won't hire you as a consultant or expert to work for them. Did I hear you say that correctly?

[p. 131] A That seems to be what happens.

Q Did anyone ever tell you that?

A They – it has been told to me by many people but I don't know if any of those were tire companies.

Q Did George Edwards tell you that?

A Well, he's one of the people that says that, yes.

Q No one from Kumho or Hercules ever told you that, did they?

A No.

Q And so far as you know, no one from a tire manufacturer or designer or seller has ever told you that?

A I've been questioned about that and don't remember the exact wording, but one manufacturer, you know, said you've got to clear that up whether you've got a case against us or not before we'll hire you as a defense guy.

Q So you had a case against that particular tire manufacturer and then they were asking you to get involved representing them?

A Yes.

Q And they perceived that as a conflict where [p. 132] you were working for someone suing them, where they couldn't necessarily hire you to work for them at that same time?

A There's always the danger of a conflict of interests if you do split. But they don't want to give you credibility.

Q I'm not talking about the conflict of interest situation, it sounds like you were saying there's some type of conspiracy where tire companies won't hire somebody if they work for a plaintiff criticizing a tire.

A I think it's generally agreed in this industry that's what happens, but I'm not trying to imply there is a conspiracy.

Q Do you have any evidence to support what you said?

A Well, there was one tire company that asked me very carefully about whether I had anything against them.

Q That was in a conflict situation I thought we established.

A Well, it was a different case, so –

Q Well, it was a different case but you were [p. 133] testifying in that case against that same tire company; is that correct?

A I would be an expert against – on the plaintiff's side against them, yes.

Q Did it involve the same tire, type of tire?

A Yes.

Q Don't you agree that would be a conflict where you were taking the position for the plaintiff in one case, criticizing the tire, where that tire company couldn't ask you to represent it or be involved with it on that same exact tire?

A I think I would like to work that way, but I don't think tire companies would like that. It could be a conflict if you're in the same type of tire if they give you information that you turned around and used against them.

Q That would be a big risk of that type of arrangement, wouldn't it?

A I think so.

Q And do you have any reason to believe that the tire manufacturer who you're talking about had anything

in mind other than that type of a risk in refusing to employ you?

[p. 134] A I don't know.

Q You didn't have any such discussions with them?

A No.

Q And you don't have any evidence of any conspiracy among tire makers or sellers or manufacturers to not hire experts who testify for plaintiffs in tire cases?

A No, it's just that every expert in the business is on one side or the other it seems like after awhile.

Q What is that based on?

A Just based on what people tell me and what I've observed.

Q How many cases are you working on right now for George R. Edwards, Inc. that involve tire failure analysis or that are tire related in any respect?

A I'm not sure I can give you an exact number.

Q Ballpark?

A Probably 25.

Q And on all those cases you're working for the plaintiff?

A All that I can recall.

• • •

[p. 172] Q Do you have any patents or hold any patents?

A No.

• • •

[p. 176] Q You're not a chemical engineer; is that correct?

A That's correct.

Q And you don't hold yourself out as an expert in that field?

A No.

Q You've never testified before as a chemical expert?

A No.

A No.

[p. 177] Q You don't have any publications in that field; is that correct?

A Right. There are chemical changes that occur in tires in rare cases that I would know something about, but I'm not a chemist. I've had chemical courses, many chemical courses in school, so I know more than the average person. But I'm not going to tell you – I'm not going to be a chemical engineering expert or chemist expert, except as where they may come to tires, I may have to talk about a chemical change but I won't tell you exactly about it, what it is, I don't think I can.

• • •

[p. 182] Q Has any court ever refused to accept you as an expert?

A No.

* * *

Q So it would be fair to say that a hundred percent of your income is derived from work testifying in lawsuits or working on cases that are being considered with respect to whether a lawsuit should be filed?

[p. 183] A I believe that is true. I would like to say there are some times we are consulted by people who want to know what happened in an accident or to a tire and they have no intention of suing anybody. And there is that type of work. I don't know how to quantify that, though.

Q Do you have any publications in any field?

A I have a master's thesis but no publications.

* * *

[p. 184] Q You said you have some publications currently in the works. What are those publications?

A Well, they're tire related or vehicle handling related.

Q Are these going to be published in any scientific or journal related to the tire industry?

A They probably will be published in SAE, if they ever get beyond the stage they are in now?

Q What is the SAE?

A Society of Automotive Engineers.

Q Do you know what the thesis of your articles are?

A One of them has to do with tire uniformity as how it applies to handling. That's just in the discussion phase with a professor at the University of Illinois.

Q You're collaborating with him on that article?

A Yes.

Q What is his name?

[p. 185] A Dan Metz.

Q And tire uniformity, does that refer to tire tread uniformity as opposed to some other part of the tire?

A Mainly casing uniformity.

Q Interior casing?

A Yeah.

Q Structure?

A Uniformity has two meanings, okay. One is how alike the tire is in construction from piece to piece, but uniformity to tire guys also means the way it – whether it has – whether it's balanced properly or whether it has radial force or lateral force variation.

I know that's a big word but when you roll a tire it may have different forces against the ground or it may have different radiuses. You know, if you roll it freely it may go up and down and bounce. And this is something that tire manufacturers control very closely.

Q What is the conclusion that you and he are reaching as a result of whatever research or testing you're doing in that?

A I guess we're in the talking stage right now [p. 186] but we're just trying to show that normal performance tires may have a lateral force bias that is higher than anybody thinks. And, you know, it's – it has an effect on handling as to where – it's based on where.

I'm working on some cases for one of the manufacturers having to do with wear and I'm working against a manufacturer for a wear case. And this was brought about by the fact that performance tires have special quantities that are built into them that are unlike a normal passenger tire. And this may affect wear. It may affect –

* * *

[p. 187] Q So if I understand, the paper that you're working on or in the talking stage of working on, it involves primarily the issue of wear of high performance type tires and the factors that would influence that?

A Yes.

* * *

[p. 189] Q And you haven't made any publications in the tire field?

A That's correct, I worked for a secret company for ten years and they didn't want anything published.

Q That's Michelin?

A That's Michelin.

* * *

[p. 190] Q What is your arrangement with George R. Edwards, Inc. or George R. Edwards the individual?

A Well, right now I'm a salaried employee.

Q And do you have any option about buying out his company or becoming a partner or equity owner at some point?

A There may be a possibility of that in the future.

Q Have you specifically talked about that with him?

A We have talked about it but the details don't need to be published right now.

Q Well, are there any agreements?

A There are agreements but they're very loose right now.

Q Handshake agreements?

[p. 191] A More or less, yes.

* * *

But if you do have any agreements with Edwards, I think, you know, given the fact that you're testifying in this case on behalf of George R. Edwards, Inc. I think I'm entitled to know about that.

A Well, he is paying me a salary. That could last for a very long time. He could hire someone else [p. 192] to be my boss when he retires. I could be the boss. It depends on how things work out in the next year or so.

Q When you say how things work out, does that mean how the money works out or how y'all get along or what?

A Well, I tell you, it depends on whether I have any business sense, probably.

* * *

[p. 195] Q Have you inspected the van in this case?

A I have just seen photographs, I have not seen the van.

* * *

[p. 196] Q Have you seen and inspected the Kumho or Hercules Superior XII at issue in this case?

A Yes.

Q When did you first see that tire?

A This morning.

Q So the first time that you had an opportunity to see the tire in person was this morning; is that [p. 197] correct?

A Yes, that's correct.

Q And where were you?

A Mr. Jackson's office.

Q How long did you have an opportunity to look at it?

A An hour or so.

Q And what did you do?

A I looked at it to see if the photographs that I'd seen of the tire represented the tire.

Q When had you seen photographs?

A For a month or two.

Q About a month prior to today?

A Yes, month or two.

Q Where were those photographs located?

A In our file in Louisville.

Q Did you see anything different in the tire that you didn't see on the photographs?

A No.

Q Do you have any change in anything you stated on Defendants' Exhibit 2 as a result of seeing the tire in person?

A No.

[p. 198] Q We'll go over that in more detail, but would you agree that Defendants' Exhibit 2 was prepared before today?

A Generally, yes. Not having read it in detail but –

Q Well, the date that is on Defendants' Exhibit 2 is March 3, 1995; is that correct?

A Yes.

Q And that's before today?

A Yes.

Q And that's before you saw the tire?

A Yes.

Q Did you have any input into preparing Defendants' Exhibit 2?

A I don't recall.

Q You don't remember whether or not you participated in preparing Defendants' Exhibit 2?

A I don't recall.

Q We'll get into that in a second.

A Yeah.

Q Have you seen or inspected the accident scene?

A No, I've just seen photographs.

Q Have you seen or inspected the other tires [p. 199] that were on the vehicle at the time of the accident?

A Yes, I have.

Q When did you first do that?

A This morning.

Q How long did you look at those tires?

A I looked at them during the hour period.

Q Had you seen photographs of those previously?

A Yes, I have.

Q Did you see anything in person this morning that you didn't note previously in the photographs?

A No.

Q Is there any change to any of the opinions expressed on Defendants' Exhibit 2 as a result of seeing those other tires in person this morning?

A No.

* * *

[p. 200] Q Do you agree at some point in time a tire will need to be replaced?

A Yes.

Q Tires don't last forever?

A That's correct.

Q Tires will become unserviceable at some point [p. 201] in time?

A That's correct.

Q Can you identify for us all the different reasons or ways that a tire can become unserviceable?

A Yes.

Q Okay.

A Well, tread can wear out.

Q All right.

A Sometimes it can be recapped, sometimes it can't. Or the carcass doesn't have the fatigue strength to last. It can have a catastrophic failure by hitting something like a big rock or a Volkswagen or something like that that causes it to rupture.

Q Anything else?

A Well, generally it's either fracture strength or fatigue strength that kills a tire.

Q What do you mean by fracture strength?

A It means it hits something and breaks it to where it can't be repaired or it fatigues which means it wears out internally.

Q And I suppose it could be a combination of the two?

A It can be.

[p. 202] Q And you've seen that before in your experience?

A Yeah, it's very hard to define in engineering terms but there's been a lot of people that try to define those things.

Q When you say it's very hard to define, you're talking about the situation where a tire is subject to both fracture forces and becomes fatigued, it's very hard to say what part is due to the fatigue and what part is due to the fracture?

A Well, there are a lot of forces that hit a tire and do not cause a fracture but, you know, it is believed that they may affect the fatigue strength.

Q Let me see if I can put that in a term that I understand it. I think I understand what you're saying. You're saying that a tire may hit something, it might not be a sufficient hit to destroy it in that moment but that it

can reduce the strength of the tire so that the tire wears out before it would otherwise have worn out?

A Well, wear out is a bad word but –

Q Well, the tire will become unserviceable before it –

[p. 203] A As a tire designer you do – you design your carcass to last a certain number of miles. And then you have to put strength in there to have a certain amount of reasonable impacts. It's very hard to define that. The only way to do it is to put them out there and see how long they last under real world situations. If they don't last long enough, then you build a stronger tire.

Q What you were saying earlier is that you can have a fracture force and a fatigue problem with a tire that combines to cause it to come out of service. Do you agree with that?

A I am trying to say that there is a fracture failure which is a catastrophic failure caused by a one-time event. Okay?

Q Okay.

A You hit something that it can't handle, that's a fracture failure, okay. Most of the other types of failures would be a combination – I mean would be a type of fatigue failure. The fatigue loading that you have is what I'm saying is hard to define.

You have normal loading which is if you ran a tire forever and forever it would fail, just if it [p. 204] never hit anything. A lot of tires fail because they hit something that causes a fracture failure and they go out of service right then. And they cannot be repaired. Okay.

And then fatigue failure, tires fail because of fatigue failure. And that can involve the whole spectrum of what can cause it. It can be designed to a low mileage due to bad materials or cheap materials or whatever you want to say. Or it can have a service life that is too heavy for it, or something like that, or too close to the limit. It's have hard to define that.

Q Why is that hard to define?

A Well, because the best way to do that is to send them out under real world conditions and monitor your results and see if there is an unacceptable failure, which is generally, you know, zero during the first life of the passenger tire and a certain percentage for truck tires.

Q Other than how a tire may react under the real world, is there any other way to test that?

A Well, all the testing that is done in a lab is a way to predict that or the test track or a machine [p. 205] test and everything is a way to predict the life of a tire out in the real world.

In other words, if you run a certain test and your new tire, your candidate tire, your prototype tire lasts better than the one that you've got in production at the time, then – on a certain machine test, then you hope that when you put it out in the real world that that type of experience that you get on the machine translates to real world improvements.

Q But there's no guarantee of that?

A There's no guarantee.

Q And that's an area that's fraught with a lot of uncertainty because you can't duplicate the real world in a laboratory, can you?

A Well, you can't. I happen to feel that testing is a – if it is done correctly, is a very, very good way of doing things if you do it reasonably, like Michelin does.

And I think they do everything very well. You know, I've said that they have engineers that are very high level that watch the quality of the tests and they help develop tests that are reasonable. But there is uncertainty in everything that you do, something like [p. 206] that, so –

Q Okay. Are there any other reasons why tires will become unserviceable, other than I think you've mentioned catastrophic failure or fracture strength failure and then a failure due to fatigue strength and then also that the tread will wear out.

[p. 206] A Well, anything can cause the fatigue strength to be reduced. You know, abuse is one. If the tire is run flat, it's not going to last very long, it's going to have irreparable damage.

Q Would you agree that exposure to certain types of chemicals, especially petroleum products, can cause tires to come out of service?

A Yes, that occurs mainly on truck tires where you have an axle that leaks and you can have petroleum – softening of the rubber.

Q Weathering of the rubber?

A Yes, ozone cracking.

Q Or just leaving a tire parked in a stationary position for a long time, that can result in premature weathering; is that right?

A Generally that produces a stress on the tire that can allow ozone cracking to progress. The [p. 207] mechanism is what I'm arguing about, but what you're saying is true but the semantics of it are –

Q Misalignment or failure to properly balance the wheels on the vehicle on which the tires are located, can that affect the service life of a tire?

A That can generally affect the tread wear very drastically.

Q Poor maintenance can affect the service life of a tire?

A Yes.

Q If the tire is punctured or cut, that can affect the service life of the tire?

A It can.

Q I think you've already stated that bruises and impacts, other types of fractures that the tire is subject to, affect the service life; is that correct?

A It can. It can end it very quickly?

Q Skid damage, can that affect it?

A Yes, it can.

Q Are you familiar with the term projection cuts?

A No.

Q Where some part of the vehicle projects onto [p. 208] the tire. Can that affect the tire?

A Certainly.

Q Service life?

A Certainly.

Q That would be a type of an abrasion, I guess, to the tire; is that correct?

A Can be.

Q Are you familiar with the term spin cuts?

A Yes.

Q What does that mean to you?

A Means where the tire is spun and it loses traction and it spins against a surface and usually forms circumferential cuts in the tire.

Q That can affect the service life of a tire?

A Yes, it can.

Q Bad valves in the tire, can that affect – bad valves?

A Valves?

Q Valves.

A The valve stem?

Q Yeah, that can affect the service life of the tire; is that correct?

A That can cause the tire to deflate, yes.

[p. 209] Q A damaged rim or wheel can affect the service life of a tire?

A Yes.

Q If the bead on the tire is torn or kinked or distorted in any way that can affect service life?

A Yes, it can.

Q Overloading can affect service life?

A Of course.

Q Low inflation can affect service life?

A Yes.

Q I mean that's a list of some of the factors in the real word that can affect the service life of a tire; is that correct?

A Certainly.

Q Do you agree that once rubber receives an injury that it doesn't heal itself like your skin would?

A Generally that is true.

Q That injury to rubber is cumulative, do you agree with that statement?

A In a sense, yes.

Q That once it gets hurt, and if it receives hurt again, it builds on the prior injury?

[p. 210] A. Generally the way it happens, yes.

Q Do you agree that there are numerous reasons that tires become unserviceable that are not the result of a design or manufacturing defect?

A True.

Q And we've gone over some of those in prior questions but can you think of any others that I haven't mentioned?

A Well, I've seen a lot of tires that were sabotaged, you know, cut.

Q Purposely cut with a knife or something?

A Purposely cut, yes.

Q Anything else?

A That's a pretty comprehensive list, I think.

Q Do you have any opinion about when a tire should be taken out of service due to tread wear?

A I have – the 2/32 is probably reasonable from an economic sense is to take it off at 2/32 Or if there is an area that has been skid damaged to where part of the tire is below 2/32 and the rest of it is good or if there is very, very bad alignment wear, I would not keep that tire on.

Q So as I understand the latter part of your [p. 211] answer there, even though part of the tire may have 2/32 tread, if another part of the tire is below 2/32 tread, you would still think that tire should be taken out of service?

A Yeah, I'm kind of a fanatic about that. I would like to see the wear bars even thicker, but –

Q More than 2/32?

A More than 2/32.

Q Why do you believe that?

A Because of the danger of hydroplaning and the fact that most drivers are, you know, not able to handle hydroplaning type problems.

* * *

[p. 215] Q Do you agree that a puncture of a tire will usually result in a loss of air pressure to the tire of some amount or degree?

A There – my experience is that there is some pressure loss when there is an object in a tubeless tire. The pressure loss is a lot less than most people would believe.

Q But there will be some pressure loss?

[p. 216] A Well, there are some people in the industry that believe there is no pressure loss under certain types of punctures. Usually the tire companies will say that. I have always measured at least three PSI per week in the cases that I've had.

Q So the best result you've ever seen in cases you've looked at where there is a puncture object, puncturing object in a tire, is a loss of three pounds per square inch per week?

A That's right.

Q And you've seen cases where it's a lot worse than that per week I would assume?

A Oh, yes, yes.

Q You've seen cases where a puncture causes the tire to go flat within a matter of minutes?

A Yes.

Q And also within a matter of hours?

A Yes.

Q And then there are the so-called punctures that result in a slow leak. And by slow leak you would be thinking about three pounds per square inch per week, something along that line?

A That's right.

[p. 217] Q And that would result, if that went uncorrected for a month, that would result in a loss of about 12 pounds per square inch?

A Approximately. It's not linear but – in other words, you lose more at higher pressures than you do at lower pressures.

Q So as the air pressure in the tire goes down the rate of loss also goes down?

A Yes.

Q But there's still air loss at the lower air pressure?

A That's correct.

* * *

Overdeflection, you used that term earlier –

A Yes.

Q – to describe the situation that occurs to a tire when it's underinflated or overloaded; is that correct?

A That's correct.

[p. 218] Q Can you define what you mean by that term?

A Generally it means that the tire has fallen below the load deflection curve.

Q And what is the load deflection curve?

A Okay, that's the curve of the load a tire can take at its inflation pressure. On the sidewall of the tire, like this tire says it takes, I think, 1,352 pounds load at 35 PSI maximum. Okay, if you cut that to 20 PSI then you would have to cut the load that it can carry by a similar percentage.

In other words, there's a – every pressure has a load it can take.

Q Is it a proportionate drop?

A It's relatively proportional, it's almost a straight line. It's defined as a straight line in most of the curves but we found that there is a slight variation.

Q Just for an example, if you were to take a tire, using this tire as an example, that has that rating, say 1,352 pounds at 35 PSI and you were to drop the PSI by 20 percent, then the load-carrying capacity of the tire at that lower air pressure would be approximately 20 percent less than 1,352 pounds?

[p. 219] A Yeah, approximately. The curve doesn't go through zero. Okay.

Q Can underinflation or overloading, the overdeflection that you're talking about, cause a tire to come out of service or become unserviceable?

A Yes.

Q Can you describe the mechanism by which that occurs?

A Well, we talked about that a little bit earlier when you were talking about running flat. This is in the category that tire people talk about a run flat, a run underinflated or uninflated type failure or run type failure. But run flat failures don't have to be completely flat tires. They can be tires that are, like you say, overdeflected.

What happens is that in the early stages you generate – degenerate the sidewall more than other tires and – I mean other parts of the tire. The tread may get hotter because the edges of the tread are loaded up more than the center. It changes the load profile of the tire. And you have an increase in temperature and you have flexing of the tires beyond what they're generally designed for –

[p. 220] Q When you say flexing of the tire, can you tell us in laymen's terms what you mean there?

A Well, it means that a tire has a certain height above the rim. And when the tire goes through the contact patch, as it rotates, it goes to a smaller height; in other words, it is compressed, okay, if you will.

It's compressed in several ways. One, most tires have a round surface. Then it becomes flat since it's pressed against the – now performance tires are flat to start with so that doesn't mean that, but then you have a certain what is called a loaded radius of the tire.

And that is – it has a normal loaded radius when it's properly inflated and properly loaded. But when it's overdeflected, that's means it's squashed down more. Either because the air pressure doesn't hold it up as well

or the load, so your tire crushes it too much. So your sidewalls are bent at a greater angle.

Q And what injury to the tire would you expect to see as a result of being run underinflated or overloaded?

[p. 221] A Generally you get deterioration in the sidewall.

Q Anything else?

A If you were to stop the tire at that time, you could see – and cut open the sidewall, you could see some deterioration in the cords. Like I say, there is – the temperature rises at the belt, the edge of the belts. And many times that there is a – the bead is stressed a little bit more against the rim.

Q And what would that result in?

A It's many times called a rim flange compression or bead groove, something like that, can cause that.

Q And what would that feel or look like, the rim compression grove?

A Well, you would have a little groove that is formed right there at the – where the rim flange is. There's a very high stress area there and a lot of manufacturers screw up the design of that. And so, you know, if you see the bead – rim flange impression, it can be one of many things. But if you overload the tire you can produce those in some tires.

Q Any other injury that you expect to see to a [p. 222] tire that is run at low air pressure?

A Well, if you continue to lower the pressure and increase the load – you know, you have different levels of this. You can have a small overload or a large overload. You can have a case where the two tire – two parts of the sidewall are – rub against each other internally. And that produces a failure very quickly, a very distinctive type of failure. And that is generally what you see in a run flat type condition.

Q Any other injury or evidence that you would see on a tire that's run at low air pressure?

A Well, the deterioration in the sidewall can produce a rupture, it looks like a hatchet has been taken to the tire and someone chops up on it. You can induce cases of separation where you have tread separation, tread and belt separation.

Q And that can be the result of running the tire at low air pressure?

A That's right. And you can also have wear abnormalities.

Q What would those look like?

A Generally you would wear to the shoulder more [p. 223] than the center.

Q Would that be both shoulders?

A Most likely, yes.

* * *

[p. 227] Q What about a ten PSI, is that reaching a run flat condition at ten PSI?

A Anything below 20 is what I would consider run flat, if you're at rated load. But, like you say, you can lower the load and lower the pressure even more and have that deflection, yes.

* * *

[p. 228] Q And if you run it at a low air pressure at the rated load it's going to wear out faster and come out of service faster?

MR. JACKSON: Objection to the form.

THE WITNESS: You can kill the tire, yes.

MR. JACKSON: I object to what he means by low air pressure.

BY MR. BABINGTON:

Q Can you explain the mechanism that causes low air pressure to cause damage to the tire?

A I think we talked about that earlier. Low air pressure by itself is not what kills tires. But low pressure with a high load, relatively – talking about [p. 229] relative terms. But you're talking about deflection of the tire. If you increase the load, you increase the deflection. If you lower the pressure, you increase the deflection.

Q And that results in greater heat build-up?

A It can be greater heat build-up and greater flexing.

Q And both of those are the enemy of the tire and the rubber materials that make up the tire; is that correct?

A Yes.

* * *

[p. 230] Q I think you've stated this already, but just for the record, you agree that some of the indicators [p. 231] and evidence that a tire has been run and operated at overload situations or underinflation situations are that you'd have uneven tread wear especially on the shoulder, compression grooves in the rim; is that correct?

A That's correct.

Q Compression groves on the rim?

A That's correct, and on the tire bead.

Q And on the tire bead?

A The compression groove is found on the tire not on the rim.

Q Would you have any markings on the rim?

A You could have a polished flange.

Q Would you have any marking other than a polish to the rim of the tire?

A Some tires leave rubber marks on it under certain types of bead grooving.

Q Would that be in a real serious situation?

A Generally it is, yes.

Q And you would have sidewall abrasion or damage?

A You'd have sidewall deterioration. Abrasion is a different type of thing, I would not use that [p. 232] word.

Q What's the difference between what you call a deterioration and what I call abrasion?

A Well, they may look the same but sidewall deterioration is usually very even around the circumference of the sidewall and abrasion is caused by hitting a curb or something. It's localized. But they look like a roughening of the surface at times, but if you cut into the tire or x-ray, you can see other damage.

Q What you're calling deterioration to the sidewall would be circumferential, that would go around the entire circle of the tire?

A Yes, and it may be on the outside or inside.

Q Would there be any other indicator or evidence that a tire has been run overloaded or at low air pressure that we haven't covered?

A Well, those are the major indicators.

Q And would you agree that if you had a tire that had those indicators and that evidence on it, that that could show that the tire was operated at low air pressure and not that there was any manufacturing defect in the tire?

[p. 233] MR. JACKSON: Object to the form.

BY MR. BABINGTON:

Q You agree with that?

A Well, you know, with the reservations as to degree. There are other things that can cause either – all of these indicators.

Q But if you had all of those indicators, that's a strong – that can be strong evidence, would you agree, that the tire was operated at a low air pressure or at an overloaded state?

A Yes.

Q And that a tire failure analyst like yourself would have to rule out that those pieces of evidence didn't point to that in his analysis?

A That's correct.

Q If you have a tire that is run at low inflation or in an overloaded situation so that the shoulders are worn below $^{2}/_{32}$ of an inch, the sidewalls have circumferential deterioration to them, there are compression groves in the rim flange of the wheel on which that tire was located, would you consider that to be a substantial alteration to that tire?

A That's an interesting word. They are [p. 234] indicators – they are indicators that can suggest strongly that the tire has been overdeflected.

Q Are you familiar with the term substantial alteration?

A Is that a legal term?

Q I'm asking legal or not, have you ever heard that term?

A I'm trying to remember. For some reason I think I've heard that before but –

Q Well, let me ask it this way, would you consider a tire that had all of those signs on it to be in the same

condition from the standpoint of strength of the tire as one when it left the manufacturer?

A Generally, yes. Like I say, there's something that can cause all of those functions that can have a different interpretation and you have to be very careful when you look at these.

Q We'll get to that in a second.

A Okay.

Q Do you agree that a tire that's run underinflated or overloaded will need to be taken out of service before a tire that has been run at the proper air pressure for the load?

[p. 235] A I think so, yes.

Q With respect to repairing a tire, do you agree that there are certain procedures that are better than others?

A Yes.

Q And let's focus on a puncture to a tire by a nail or screw or other similar object –

A Right.

Q – that occurs in the crown or tread area of the tire. What is the proper procedure for repair of that type of puncture to the tire? And let's again assume that it goes all the way through the tire, even through the inner-liner.

A Right. Well, there's two major types of repairs. The one that I think is slightly better, somewhat better, is called a patch type repair where you take the tire off the

rim, you treat the inside and put a patch and then you fill up the hole with gum. You sometimes have to drill it out to make sure the wires are not pushing into the inside.

There are various types of these types of patches. And there are many types for truck tires and then there are the kind they use on passenger tires. [p. 236] They use some kind of chemical, glue, heat-set glue or whatever that glues it to the inside. You have to buff the inside usually to make it stick better. After you treat the hole you have to fill it up with a soft gum rubber.

Q So let me see if I can summarize this. What you're saying is when you have a flat caused by a penetration of an object from the outside of the tread of the tire through the inner-liner that what you should do is you should remove the tire from the rim and match the inner-liner and fill the hole on the outside of the tire; is that a fair summary of what you said?

A That's a good summary of it.

Q And I think you were saying there were different ways you can fill the hole and patch the inner-liner, but would you agree that a good repair would do both of those things?

A Yes.

Q And that if you don't, if you just patch the inner-liner but you don't fill the hole on the exterior of the tire, that that's not a good repair?

A It's not as good. You can get away with it in [p. 237] some climates. But most of the places in most of the United States you would get salt in the hole and it would deteriorate the steel belts very rapidly.

Steel belts have the capacity to wick moisture throughout them because they have gaps between the steel. And that's a very common failure in truck tires.

Q Once you get moisture into the steel belt area that's bad for the tire?

A Yes, it is.

Q And you would agree that if you don't fill the exterior hole that moisture and air and other foreign material, dirt, salt, whatever, is going to be able to get into that hole and migrate?

A Yes, it sounds bad but it seems to really affect the Northern states much better – tires from the Northern states because of the salt. And that seems to really cause a problem.

Q So if a tire is operated in an area up North where you have that, that can be bad for the tire if you don't fill the exterior hole?

A Well, yes, if you don't fill the exterior hole it can be very bad, yes.

[p. 238] Q And the air migration and moisture migration in the steel belt layers can cause weakening of the tire's interior structure; you agree with that?

A Yes.

Q And that can lead to the tread separation and steel belt separation; do you agree with that?

A Yes.

* * *

[p. 242] Q Backing up a little bit. Before the repair is made, the tire has been penetrated by a puncturing object and then the operator of the vehicle takes it into a service station or some other repair facility and says, "Please fix my tire."

As I understand what you said earlier, that person should take the tire off, look at both the interior and exterior of the tire. Do you agree that [p. 243] one of the decisions that person who is doing the repair needs to make is whether or not there's been any damage to the interior structure of the tire, to the belts or the tread, and whether any type of separation has begun so the tire should be taken out of service?

A Well, in the ideal world I would say that he should. I don't think that people that repair tires generally have that type of expertise. But any overt types of problems – the main things they look for are any wires that go down in there that would go through the patch.

In other words, a lot of times when something goes through a tire, it pushes wires that way, and that's one reason they try to go both ways when they drill it out. And that's one thing they look for. And I know that in good tire shops, you know, that they do look for evidence of separation, like abnormal wear and bumps or something like that.

Q What are the potential causes of loss of adhesion in a tire between its various layers?

A Potential causes?

Q Yeah.

A Well, first, of course, is if the tire was [p. 244] made improperly and – or improper design. And then you can abuse the tire in various ways. Overdeflection is the most common way. Or the only practical way.

Q Any other type of abuse that would result in loss of adhesion?

A There's not any common ways.

Q Well, uncommon or not, can you list them for me?

A As I mentioned before, you know, theoretically it's possible, if you treat the car like a sports car, to develop this. But as I said before, I don't think that's practical because you'll wear the tread out before you would damage the casing. You can –

Q Is that where you would corner the car –

A Yeah.

Q – at angles –

A Yeah.

Q – that put a stress on the tire?

A Very high slip angles. The tire has to be heated by running all the time. There are certain types of suspension defects, like if you're running at a very high camber, that will produce it. For instance, like if you took a Ford front end with a twin [p. 245] I-beam and had something wrong with it to where the tires ran like that all the time, you could develop it. There are certain types of suspension on older European cars that can develop that.

Q In your last answer you pointed your hands inward so that the tires were sort of making a V or U shape?

A High positive camber.

Q And that would be where tires are pointed, the bottom of the tires closest to the road would be pointed in making a V?

A Yes.

Q For lack of a better description.

A There are certain suspension problems that can induce that, they are kind of rare but you see them on trucks a lot more than you do on passenger tires.

Q Any other potential cause of loss of adhesion?

A There are certain tires that have come out that are very sensitive to ambient temperature. They all fail in the Southwest but I guess that's a design problem.

Q Anything else you can think of?

A Not right now.

[p. 246] Q Do you agree that heat build-up can weaken the interior strength of the tire and cause loss of adhesion, excessive heat build-up?

A Excessive heat build-up.

Q And that's what you were talking about earlier?

A Yes, there's – there's a threshold idea and then there's a proportional, the time and temperature, but that time and temperature may not be a linear function.

Q Once you get to the magic number of temperature, then it happens very fast?

A Yes.

Q And up to that point it may happen more slowly?

A Yes, there's – there may be two critical numbers. One for long-term life and then there's one for short-term life, if you would, if you want to put everything in two numbers. But everything is proportional.

You can run something at very low stress and produce hardly any damage over the tire for a long period of time, you know. If you do it like that, it's [p. 247] kind of a threshold type of idea of stress. But you still build up a little fatigue, it's just that that may not have enough to count.

Q What about your person who has a slow leak in a tire and the tire gradually falls in air pressure and then he brings it into the service station, fills it up back to the proper level, and then drives it around and it gradually falls in air pressure until he goes into the service station again and fills up with air.

A Uh-huh.

Q That particular tire that undergoes that particular pattern of losing air pressure and then being filled up, losing air pressure and filling up, is going to experience a cumulative weakening of the interior strength of the tire; isn't that correct?

A Theoretically, yes. It's best to think about these things as to whether the carcass is going to outlast the

tread life, okay. The carcass should have a margin in it that means that it lasts longer than the tread life.

Okay, if you abuse the tire by running it flat, you may reduce that margin. And then if you run it a little bit more, like in this cycle, you may [p. 248] reduce it more. And then you may reduce it to where the carcass fails before the tread life is worn out.

And that's the way to think about endurance of the casing. You know, the casing should last longer than the tread but, you know, you may reduce that margin. You know, most people who may have a tire go flat once or twice or ten times may never see it because they wear the tire out before – but they have secretly reduced that margin, but they never see it because the tire gets thrown away at the end of the first.

Q And that would all be a matter of degree of the abuse of the tire subject to, for example, how much it's overloaded or how low the air pressure is allowed to get and how long it's run at those various improper over-deflected levels; is that correct?

A And the quality of the tire. Some people build in a greater margin. And at one time some carcasses for passengers were built to be recapped, so that margin would be twice the original wear on average, you know, so, you know that's the way to think about it. It's the best way to think about it.

Q How would you isolate in tire failure analysis [p. 249] the – to a particular potential cause of loss of adhesion, how do you do that?

A Okay, the first step is to eliminate the causes of abuse, I mean the factors of abuse. There are usually indicators on the tire that show when a tire has been abused.

And then after that it's very hard to isolate between the factors I mentioned several hours ago, you know, contamination or lack of – you know, overaging the products and things like that. You cannot really determine on a vulcanized tire which factor it was.

Sometimes you can do chemical analysis and find butyl contamination or something like that inside the tire. But generally you eliminate the causes of abuse and that gives you a separation that has to come from the quality of the tire.

Q Or you find evidence that would point in the direction of the reason for the loss of adhesion being abuse of the tire and you can eliminate manufacturing or design problem as the cause; is that correct?

A Most of the tires I get are that way. Most of the tires I get are eliminated.

Q In other words, you don't find a manufacturing [p. 250] defect; is that what you're saying?

A I don't find a manufacturing defect but fairly rarely. You know, it's a small percentage of the tires that I see.

Q And what evidence is significant to you in going through that process? What in particular are you looking for?

A Well, in separations you look at the wear pattern, the sidewall and the bead groove. In a nutshell.

Q Tell me what you look for in the wear pattern.

A Well, the wear pattern can indicate not only the presence of abuse but the presence of a separation that has been long term.

Q Would that separation may have been caused by the abuse?

A Well, the –

Q Is that correct?

A It can be, depending on the nature of the wear.

Q What type of wear patterns would you expect to see where the long-term separation is caused by the abuse?

[p. 251] A Well, the simple answer is, you know, the shoulder wear is more severe than the center wear. But you have to have certain, you know, it has to be a certain type of wear. But generally if the wear level is greater in the shoulder than the center, it generally indicates that you're running in an overdeflected condition.

Now you have to be very, very careful because one of the things in tire design is to equalize the wear. And there have been many tread designs that wore either in the center or on the edge where it was normal wear. It's been very hard for radial tire manufactures to equalize that in some cases.

Q Have you done any study of the Hercules Superior XII in that regard?

A No.

Q So you don't know whether it has any propensity to wear at the shoulder?

A No, I don't.

Q And you don't have any opinion about that?

A Not right now.

Q You also mentioned that it would be sidewall evidence?

[p. 252] A That's correct.

Q And what particular evidence would you look for on the sidewall?

A I would look for the deterioration on either the outside or the inner-liner that you can see. You can see discolorations, you can see a change in the texture, you can see outright deterioration of the tire.

Q And you also mentioned that there would be evidence in the bead groove area of the tire. What would you look for there?

A Well, to see if there is a bead groove on both beads. There again, that is a critical area for the designer and there are beads out there that – most tires do have a bead groove of some – after they've been in service for awhile.

And it is rather, I think, rather difficult to determine what is abnormal bead grooving. Usually in light truck tires and truck tires it's much more definitive.

Q And the converse would also be true that in a passenger tire it would be very difficult to determine

what is a normal bead groove, if it's difficult to [p. 253] determine what is abnormal?

A In a perfect world I would look at a lot of tires and determine whether the manufacturer screwed up or not, his bead design, okay, if I could see a hundred tires that had been run under ideal conditions or whatever. I see a small window of these tires. And we think that if it is past a certain level of bead grooving that we're pretty sure that the tire has been abused.

We would like to see comparable, something comparable, like the tread wear, we like to see two out of the three things I was talking about or two out of three things to determine.

Q If you had two out of three that would be a pretty strong indicator of abuse?

A It would be stronger, yes.

Q And if you had three out of three that would be definitive in your opinion?

A It would be pretty – close as I could get.

Q Now I think we mentioned earlier that when you have really had bad overdeflection you can get actual imprints of the bead on the rim of the tire on which that particular tire is located; is that true?

[p. 254] A You can have polishing and you can have, in some cases, gummy rubber on there. That's pretty rare to me but –

Q And if you had indications on the rim of the tire, that would be even stronger still; would you agree with that?

A Partially.

Q What part don't you agree with?

A Well, normal use can polish the rim, normal use, depending on the tire design. Some tires seem to be more prone to that than others. And I'm not sure I know everything there is about that, you know, comparing one manufacturer to the other. But, generally, polishing that is very, you know, very shiny and everything is an indication that you may have overdeflection.

Q Going back to the comments you were making about the bead groove on the bead of the tire itself, you said that ideally you would like to look at a fairly large number of the same type of tire –

A Uh-huh.

Q – hundred or so, to see what the normal bead groove looked like for that type tire; is that correct?

[p. 255] A Yes.

Q Have you done that with respect to the Hercules Superior XII at issue in this case?

A No.

BY MR. BABINGTON:

Q Let's go back on the record, I want to ask you a question about something that we left off on. As I understand, the bead groove evidence that you would expect to see where you have an overdeflection situation causing a loss of adhesion, is that there would be marks on the tire bead groove itself, correct?

A There's a mark on the bead, the tire bead, yes.

Q That's –

A A groove on the tire bead.

Q A groove on the tire bead. That would be different than the normal groove that you would see on the same type of tire under normal situations?

A Yes.

Q And in order to make a determination as to whether the groove on the tire bead is normal or abnormal, as I understand it you need to look at a [p. 256] hundred or so of the same type tires to see what the normal groove looks like?

A Well, there – that is mainly to see if there is a problem in the manufacture. Among normal tires you have a relative indicator of the bead groove. You know, if you suspect that it is from the manufacturing process, you would need to see a hundred tires to determine in fact if there was a bead design problem.

Many tires have a normal bead groove which is a certain size. And then we classify that as – as something that is like a normal bead groove. Okay. And it doesn't really indicate that there is overloading or that there is a manufacturing problem.

But if we do see consistently – I've got one tire that I suspect that has a problem. And I've seen six of these, okay, and they all have bead grooves. And that is almost enough for me to determine that they have a problem in designing the bead. Okay.

But under normal circumstances you can determine whether a bead is – bead groove is abnormal or not with reasonable accuracy or confidence.

Q Let's take a step back because I think we're missing each other on this one. I was talking in the [p. 257] context of where you were looking at the potential causes for loss of adhesion of the tire.

A Right.

Q And I understood you to say that basically the two types of problems that you are looking at in that context are some type of a manufacturing defect or problem?

A Uh-huh.

Q And then a loss of adhesion that's caused by overdeflection. And I think you've listed a couple of others but you said those are very infrequent.

A Oh, okay, yes.

Q Is that a fair summary?

A I think so, yes.

Q And then I asked you, well, looking at the loss of adhesion that's caused by overdeflection –

A Uh-huh.

Q – what evidence would you expect to see. And I understood you to say that there would be three primary pieces of evidence or indicators, which would be abnormal wear pattern on the tread, mainly in the shoulder areas, there would be sidewall deterioration around the

entire circumference of the tire on the [p. 258] inside or the outside and then you would have certain bead groove evidence.

A That's right.

Q Now focusing just on the bead groove evidence, I understood you to say that in order to determine whether that bead groove evidence that you see is abnormal or normal you would have to look at a hundred or so similar tires of the same type to see what a normal one looked like, only then would you be able to see if it was abnormal.

A Well, that is generally correct. You don't generally suspect that the manufacturers have a problem where there's an abnormal bead groove formed under normal operating conditions. This is kind of – if I did suspect it, I would like to see a hundred tires or, you know, some number of tires. I only see, generally, four or five tires from one manufacturer at a time. Maybe ten tires or something from the different cases. If they have problems I may see ten tires.

But if I did suspect that, I would like to see a lot of tires, whatever the number is, as many as possible, to see if that is – see what is an average bead groove.

[p. 259] Now if I were back at Michelin and wanted to define this problem, you know I would look at a hundred tires, if I could, and try to define the loading on each one of those tires to see what is a normal wear in the bead – in the bead of those tires. Okay.

Q And that would be a normal wear at the proper load for the air pressure in the tire?

A That's right.

Q What we're talking about is a situation where you have overdeflection which would be an overload for the air pressure in the tire?

A That's correct.

Q And in that context what would you expect to see on the bead groove?

A We –

MR. HERLONG: On the Bead.

BY MR. BABINGTON:

Q Well, I'm sorry, on the bead of the tire.

A Yeah, on the bead. You can have normal loading that produces a small groove. A bigger groove, which we have, you can see the extent of it, would be an indicator of overloading. You know, most every tire has a small groove in there after some usage but it [p. 260] gets bigger and bigger with more and more deflection and longer use.

Q All right. Now also an earlier question before we got on this line of questioning, I understood you to say that overdeflection can also cause polishing of the rim of the wheel on which the tire is located and that there is a rubber imprint or rubber residue of some type that can also be left in that rim groove; is that correct?

A You can leave rubber deposits on the rim under extreme circumstances and you can, conversely, have a polished rim under normal operating conditions, so they

aren't really that reliable an indicator but, you know, it is something you can look for.

Q With respect to the rim of the wheel, would you expect to see an imprint, some type of like imprint of the tire bead on there under extreme circumstances?

A That's too general, I think.

Q In looking at the rim of a wheel on which a tire is located that's suffered severe overdeflection, have you ever seen any type of imprint left by the bead of the rim flange?

A I've seen lots of things in different cases [p. 261] but there's not one there that I consider that much reliable. I mean that reliable an indicator of overloading.

Q If you had that on a rim of a tire would that or would that not be an indication of overdeflection?

A Depends on what you mean by calling it an imprint. You know, a tire doesn't leave too much of a – doesn't change metal, except maybe by polishing it. It doesn't imprint the metal. And what you may be talking about is that there may be black marks on the rim due to some deterioration of the rubber. You can see that.

Q And that would be evidence of overdeflection?

A Yeah, it can be but it's not a good one. On truck tires you see that quite often due to overheating of brakes and such.

Q On passenger tires, if you had that type of evidence that you're talking about, would that be an indication of overdeflection?

A It could be an indication, yeah.

* * *

[p. 262] Q Okay, I'll get to that in a second. As far as the rim, I'm talking about an imprint where it looks like you've got a pattern that's been pressed, if you will, onto the rim where it left a little pattern.

A Okay.

Q You know what I'm talking about?

A Yeah. That's a bad word but I know that [p. 263] people use that. There is a pattern that can be pushed onto the rim but it's mainly just rubber particles, it's not an imprint in the metal.

Q Would that be an indication of overdeflection?

A It can be. It usually means that there's some high temperature there in the bead.

Q And high temperature in the bead can occur during overdeflection?

A Kind of, yeah.

Q Is there anything else that causes that?

A Like I say, the rim getting hot for some reason, like overbraking or conditions where there may be a defect in the brake.

Q Anything else that could cause that?

A I don't think so.

Q So the two possible causes of that on the rim would be overbraking or overdeflection?

A In a nutshell.

* * *

[p. 276] Q Do you agree that there is room for difference of opinion with respect to interpreting the evidence that may be located on a tire in determining what is the potential cause of loss of adhesion?

A I think there's always differences of opinions.

Q What I'm getting at there is that how you interpret the evidence is subjective; isn't that correct?

A To a certain extent, yes.

Q And that two people who are equally qualified might look at that evidence and disagree about what it means?

* * *

THE WITNESS: I don't know what other people would do. There should be some evidence that should lead you in the right direction.

Q Are there any tests that you can run that can [p. 277] pin down whether or not a loss of adhesion was caused by overdeflection as opposed to some manufacturing defect? And I'm talking about after the tire had failed. Are there any tests you can do that can eliminate one or the other as potential cause?

A There are some.

Q What tests?

A Well, in some cases we see alignments of belts that cause problems. And I don't know if I mentioned

that earlier, but we could x-ray the tire and see if there is a – if we suspect that the belt is either too long or too crooked or something, we could do.

As I said there is a test for butyl contamination, which is sometimes reliable if you suspect that. But generally there's not a hard and fast rule to find out what type of problem caused the loss of adhesion when there is a manufacturing defect.

Q I'm talking about trying to pin it down between a manufacturing defect or a loss of adhesion caused by overdeflection and abuse to the tire. Are there any tests you can do to eliminate one or the other of those as a cause or potential cause?

A The indicators for overloading are the best [p. 278] indicators of loss of adhesion.

Q And we've already gone over those items of evidence and whether – I think you agree with me that whether or not those items of evidence are present or not is largely a subjective type of determination?

A They can be subjective in degree. They can be caused by other things and you have to be careful.

Q As I understand your testimony there's no test that you can run that has any verifiable or statistical accuracy that will eliminate manufacturing defect as a cause or, alternatively, eliminate overdeflection as a cause of loss of adhesion?

A Well, when we eliminate the facts – I mean the causes – when we look for the indicators of overloading

or overdeflection, as I see, and eliminate those as a possible cause, then there is nothing else but a manufacturing defect.

Q And, conversely, if those are present, those evidences of overloading and overdeflection or low air pressure, then that would eliminate a manufacturing defect as a cause?

A Well, as I say, there is something that can cause other parts of that. We like to see at least two [p. 279] of everything, two indicators in everything. And that generally does not – that is a good indicator that there is a manufacturing defect. It may have gotten twisted in the double negatives.

Q I think what you're saying is if of the three indicators of overdeflection, which are abnormal wear pattern in the tread?

A Uh-huh.

Q The sidewall deterioration?

A Yes.

Q And the bead groove –

A Uh-huh.

Q – indication. If you can eliminate two of those three, then you feel like it's probably a manufacturing defect.

On the other hand, if two of those three are present, you feel like it's probably a loss of adhesion – excuse me, an overdeflection problem that caused the loss of adhesion; is that correct?

A Yes.

Q I guess where I'm hung up a little bit is determining whether those indicators are present is largely a subjective determination.

[p. 280] A Things like –

MR. JACKSON: Wait a minute, wait a minute, that's not a question. You want to ask him a question, he'll answer it.

BY MR. BABINGTON:

Q Well, let me see if I can rephrase it. Determining whether those items are present, abnormal wear pattern, sidewall deterioration, the bead groove, is largely a subjective process?

A It can be a subjective process to a degree. To a degree. You know, for instance, if there is no bead groove there you most likely suspect that there was no overloading. If it were also collaborated by no abnormal tread or no other deterioration in the sidewall, or whatever, that would be cut and dried.

You know, you would be very confident in that. As I was talking before, that there seems to be a – a small groove that is formed in a lot of tires that doesn't indicate that it's an overload. But it's – you can see when it does become an overload with some degree of certainty, you know, fairly good.

There is a subjectiveness. You can't measure and say that five millimeters is something and five [p. 281] mill – you know, six millimeters is something else. You know, you can't – it's not that kind of test. We just have to rely

on our experience in looking at a lot of tires and testing a lot of tires to find out where those factors are important.

Q In this area of trying to isolate the cause of loss of adhesion to a manufacturing type defect as opposed to an abuse injury caused by overdeflection, there is, it sounds like, a lot of uncertainty and room for subjective determination. Is that true?

A Well, I don't want to belabor the point of uncertainty but there's uncertainty in everything that we do. And there is some subjectiveness in this but then there's hard and fast rules that we go by.

Q Do you know what the error rate is –

A No.

Q – for this type of determination?

A No.

Q Has that ever been calculated?

A No.

Q What are the hard and fast rules you're referring to?

A Well, determining whether the bead groove is [p. 282] abnormal, whether the wear is abnormal or caused by some other factor, or the bead groove is caused by the accident or some other – some other cause.

Q Let's talk about the bead groove.

A Uh-huh.

Q As far as the determination of whether a bead groove is abnormal or normal or caused by some other

factor, as I understood your testimony earlier, you have to look at hundreds of tires to see what the normal pattern looks like; is that correct?

A Well, you have to look at – if there is no bead groove, then you would suspect that there is no problem with overloading on any tire. You know, that if you do have a bead groove, you have to look at both of them on both sides.

You have to look at – you would like to look at other tires to see if the manufacturer has the problem, which is hard to determine, but is not that common for them to have it, even though it is a difficult problem. Generally they find those problems in the development of the tire, hopefully. But all, you know, most tires do have a small groove. And you're talking, to be really definitive, you have to [p. 283] have a big groove there to show that you're overloaded.

Q Can you have overloading without having a bead groove? Or let me rephrase that. Can you have overdeflection caused by either overloading or low air pressure but not resulting in a bead groove?

A Yes.

Q So the fact that a bead groove is not present does not mean that the tire has not been overdeflected?

A No, the conditions are very, very restrictive. Okay. It has to be very, very short-term. You know, like two or three cycles, you know, rotations of the tire. Okay.

And then I suspect that certain manufacturers have less grooving than the others, so that makes it a little harder to determine. But I think that when you have one

manufacturer, I think, that has less grooving than all the others, then that makes it a little easier.

Q Well, what tests have you done to determine the degree of bead grooving that will occur with certain types of overdeflection?

A Well, I've looked at lots of tires.

Q So you haven't done any tests, it's just that [p. 284] you've looked at lots of tires; is that right?

A Right.

Q And you don't know what the error rate is in your experience. I mean obviously some of these tires you've looked at, you didn't see and witness the failure, and you're just trying to piece together what happened afterwards; is that correct?

A That's correct.

Q And there's no way to test whether what you concluded was right or not?

MR. JACKSON: Object to the form.

BY MR. BABINGTON:

Q Or what your error rate is in the subjective determination you made; is that true?

A There is uncertainty in that.

Q Now with respect to tread wear, abnormal tread wear pattern, you said that there can be other causes of abnormal tread wear pattern besides overdeflection; is that right?

A That's correct.

Q How do you eliminate or isolate the cause of abnormal tread wear pattern?

A Well, you have to look at the vehicle. You [p. 285] can look at other tires on the vehicle. You can look at the tire and see the different patterns, the subtleties of the pattern, of the tread wear pattern.

* * *

[p. 285] Q. Are there any tests that you can do to determine what causes abnormal tread wear?

A. I have studied that for a long time and there are many research papers that talk about that.

Q. Do any of them come to a conclusion that there are certain tests that can be run that will say, yes, this type of tread wear abnormality is caused by this set of circumstances and this slightly different set of tread wear abnormalities was caused by this other set of circumstances?

A. There's quite a few.

Q. Are there any that you rely on in any of your testimony in this case?

A. I have read many of them.

Q. Well, are you relying on them in your testimony in this case?

A. Probably, the information.

* * *

[p. 286] MR. BABINGTON: These articles or studies of tests that will determine what causes abnormal tread wear pattern. If that is indeed something you're relying on in this case.

THE WITNESS: What information I read and studied and combined with many other studies that I did, you know, involve my experience. You know, I can provide you with some papers, I think, if I still have them, that are fairly definitive talking about underload and overload of tires and the effect on the wear pattern.

BY MR. BABINGTON:

Q. And are these studies that have been published?

A. Yes.

Q. Are they studies that contain conclusions reached after certain types of control tests?

A. Yes.

Q. Have they been subject to peer review?

A. I believe so, they were published by the SAE and I don't know anybody that's as good about weeding out bad papers as they.

[p. 287] Q. You haven't authored any of these papers, just so I understand that?

A. No.

Q. But you are relying on them in support of your testimony in this case?

A. Well, to a certain extent, yes, it's a part of my knowledge.

* * *

[p. 289] Q Again focusing on the abnormal tread wear pattern that you would expect to see in an over-deflection, as a result of overdeflection, what are you looking for specifically that would indicate whether that tread wear pattern is the result of overdeflection as opposed to some other cause?

A Well, generally the first thing is increased wear at the shoulders with rounding of the shoulders. There can be some feathering.

Q What is feathering?

A The front part of the tread block may be a little higher than the rear or vice versa.

Q Go ahead. Anything else?

A Any edges might be a little lifted, you know. [p. 290] Feathering can also be like if you have a sipe, or something like that, with one side higher than the other. You know, if you rubbed your hand across it you feel it one way but you don't feel it the other. That's generally feathering.

Q Anything else?

A Well, in some cases there can be some surface texture abnormalities that can be rougher on the edge, the rounded area, depending on the tread design.

Q Anything else you would look for?

A I think that's about all. There's some people that look at the tread grooves and there can be some polishing

there in the tread grooves in extreme cases with certain types of tires and certain types of tread designs.

Q The tread grooves referring to the valley part of the tread?

A Yes.

Q And all of those things you just mentioned would be evidence of the tire being injured as a result of over-deflection?

A It could be.

Q Well, what else could cause those?

[p. 291] A Well, you can have, like I say, you can have problems with design of the tire which is – was a big, big problem 20 years ago. And, you know, you can have suspension problems. You can have certain alignment problems that can cause some of these factors.

Q Are there any manufacturing defects that can cause those types of problems in the wear pattern of the tread?

A It's very rare.

Q So if you have those types of wear patterns in the tread, specifically on the shoulder area of the tread, that would be a very strong indicator of overdeflection?

A Well, it can be. Usually we like to say that if it's combined with one of the other factors, then that's a stronger indication. By itself it's not that much. None of these factors by themselves are that strong an indication but taken together they can be strong.

Q Well, what else would cause that abnormal wear pattern that you just described?

A Alignment and vehicle problems and driving habits, you know, whatever.

[p. 292] Q So there could be a lot of different causes of that?

A Yes, sir.

Q And so again if you were trying to make a determination of what caused the loss of adhesion, and one of the pieces of evidence you're considering is the wear pattern, there's a good bit of subjectivity in determining whether that wear pattern was a result of overdeflection or some other cause?

A Well, I'm not sure I would call it subjectivity, you just have to have knowledge as to what can cause wear patterns. If that's subjectivity, then it's subjectivity. But I call it knowledge.

Q As I understand what you're saying, the same wear pattern can be an indicator of several different things?

A Yes, you have to look at other parts.

Q And if you have an abnormal wear pattern on the tread that you described, as well as some of these other indicia, which are the sidewall deterioration and the bead groove, then that would be very strong evidence of overdeflection causing the loss of adhesion?

[p. 293] A That's right, if you have two or more indicators then that's very, very good evidence.

Q If you had just the abnormal wear pattern by itself, that may mean that there was overdeflection but what you're saying is it wouldn't be definitive?

A That's correct, in most cases. It may be that you're able to determine some other way, by eliminating it some other way, by vehicle history or whatever.

Q Unless you can come up with another more likely cause of the abnormal wear pattern how can you eliminate overdeflection as the cause of the abnormal wear pattern?

A That was too long a question, I'm sorry. The process is I would like to see two of the indicators of overload before I consider the overloading to be a factor. With tires, you know, like I say there's usually multiple causes of a lot of things. And by looking at the tire, wear is – can be a lot of things. You know, the vehicle, the way it's driven, construction of the tire, you know, the history of the tire, whatever, what wheel it's on, what wheel position it's on and stuff like that.

You know, the tread wear is not an indicator [p. 294] by itself unless you have very good evidence otherwise that the tire was overloaded. And like I say, we like to see two of them before we will indicate that a tire has been overloaded severely because we like to see the bead groove and the wear pattern both.

Q Would you agree with me that tire failure analysis of the fashion that we're talking about here is not an exact science?

A Well, very little is an exact science.

Q Well, let's talk just about this one.

A Yeah.

Q Would you agree it's not an exact science?

A It depends on experience quite a bit.

Q Are there any tests to determine the adhesion that exists between the various components of the tire?

A There's many tests that are done by tire manufacturers to test the adherence.

Q Have you done any of those on the tire in this case?

A No.

Q What are the types of tests that are available?

A Well, there's pull tests and there's all types [p. 295] of greenstick type tests. These are done generally in the factory to test each rubber batch as it comes out of the mixer or the mill.

They usually take a small amount of every rubber that comes out of the mill and put it in – they put it either with a steel cable or polyester or something like that and do pull tests.

* * *

Q Are there any tests of adhesion that you can use after a tire failure?

A After a tire failure there are none that I would use.

Q And why wouldn't you use them?

A Well, I think that after a tire has been [p. 296] through an accident scenario or something like that that it gives you rather dubious results.

Q It would be unreliable?

A I would think they would be unreliable. Hardness test can be an indicator of cure if you suspect an extreme undercure. But then again I think that's unreliable on a tire that's been run for several thousand miles.

* * *

[p. 297] Q Can you define for me what you mean by separation?

A Separation is separation of products.

Q In the context of a tire what does it mean?

A It means some of the parts don't stick together anymore.

Q Are there different types of separation?

A Well, I suppose there are.

Q What are they?

A Well, generally they're classified as edge belt separation, tread separation or belt separation or separation between the carcass and the belts or separation between the rubber products. There can be separations between the carcass ply or even the bead and the filler material around the bead.

So generally it's classified by where they are and between the products that separate.

* * *

[p. 301] Q All right. Are there any tests that you're aware of that can be used after tire failure to narrow the cause or potential cause of separation down to a particular cause?

A Cause of what, separation?

Q Yes.

A There is, like I say, very few tests after the fact except to eliminate other causes, to eliminate [p. 302] certain causes, like overdeflection.

Q So there's no test that you can perform after the fact to say for certain that this is the cause? I'm talking about tests now.

A There are tests that are done but they're very rare and I don't think they have that much validity after an accident tire.

Q They're not reliable as we discussed?

A There is butyl contamination tire, I mean test, but that is not usually found in the tread because the butyl is put on with the tools at the very start of the manufacturing process and the belts are put on second to last, just about.

Q So that would not be a very reliable test?

A It's not – it's not very common. It's a fairly reliable test if you can get it done right.

Q It's hard to do it right?

A Yes, sir.

Q And you haven't done that in this case?

A No.

Q So it sounds like the way that you go about determining the cause of separation is similar to a differential diagnosis in medicine where you try to [p. 303] rule out other causes if you don't know the cause of a particular symptom or disease; is that right?

MR. JACKSON: Object to the form.

BY MR. BABINGTON:

Q Is that right, is that what you're saying?

A I'm saying we try to eliminate all the other causes.

Q So you arrive at a conclusion in your tire failure analysis by eliminating other causes?

A Yes.

Q Are there any publications that would discuss how you go about doing that sort of tire failure analysis?

A I don't think so.

Q Are there any generally accepted theories on how you go about doing that sort of tire failure analysis?

A I think this is a generally accepted theory is to eliminate all the other causes.

Q And what do you base that statement on?

A I've read many depositions from tire experts.

* * *

[p. 304] What factors in general determine how long it takes for a separation to occur?

A The quality of the tire and the type of use.

* * *

Q And would you agree as a general proposition that if you have greater abuse of the tire you're going to have a quicker type of separation?

[p. 305] A Generally, yeah.

Q And if a tire is poorly made that you would expect to see separation occur earlier in its life?

A It's possible, yes.

Q If a tire lasts a long time, that's an indication that the tire is well made?

A It can be.

* * *

Q One follow-up question on shoulder wear. Do you agree that shoulder wear increases as the overdeflection increases?

A It generally does.

Q And to state that another way is that shoulder wear is directly proportional to the degree of overdeflection?

A I don't think I can go with that.

Q You can't agree with that one?

A No, because it generally has that factor but there are things that can decrease that and directly proportional implies a lingering relationship and I [p. 306] don't think that is true.

* * *

[p. 308] Q Can you define polish for me?

A Well, it's when the rubber products, or even the steel, have been rubbed together to where they have a shiny appearance.

Q How do you define shiny?

A Well, it looks shiny, shinier than what it's supposed to look like.

Q And there are degrees of shininess, would you agree with that?

[p. 309] A Not really, there's usually a very rough surface or very shiny.

Q One or the other with very little in between?

A Very little.

Q Can you identify all potential causes of polish for me?

A Well, generally it means that the tires have been rubbed together under use, rubber products have been rubbed together under use, and it means that they are loose, they have a lack of adhesion.

Q Is that the only cause of polishing?

A That's the major cause, yes.

* * *

[p. 310] Q And what is the mechanism that causes polish, can you describe that for me?

A As you rotate a tire it is compressed and the two pieces are compressed together. And as they're compressed together they slip a little bit and this polishes the rubber.

Q How do you determine whether polish is present or not?

A You look at it.

Q Is there any other test that you can do or any other type of procedure?

A I can imagine some. Measure the degree of reflectivity of the rubber surface, but they aren't generally used. It's mainly a visual thing.

Q Would you agree that what is shiny to one person may not be shiny to another person?

[p. 311] A. I think this type of shininess is evident to most people, the type of shininess that you see in a tire that has come apart from separation.

Q You don't think there's any room for difference of opinion as to whether polish is present or not when you're doing tire failure analysis?

A I doubt if there's very much room. You know, there's variation in every human endeavor but I don't think – I think this is pretty cut and dried.

Q Have you determined what the error rate is with respect to trying to make a determination of whether there is polish present?

A No.

Q Do you know if anyone has done that?

A No.

Q Are you aware of any publications that discuss how to do that, determine whether polish is present or not?

A No.

Q And what is chafe?

A Chafe is a rougher surface that is the beginning of the polishing process.

* * *

[p. 312] A That's right.

Q How do you make that determination?

A That's a little harder.

Q How do you do it?

A Well, you look at it.

Q Would you agree that there's room for difference of opinion as to whether chafe is present or not?

A Yes.

Q And that there's a lot of uncertainty in making that determination?

A There probably is.

Q With respect to tread wear and determining tread depth, how do you do that?

A Tread wear and determining tread depth?

Q Yeah.

[p. 313] A What do you mean?

Q How do you determine tread depth?

A You measure it with a gauge.

* * *

[p. 315] Q Do you know what the initial tread depth was on this tire?

A I don't know exactly, I heard that it was 11/32 somewhere.

* * *

[p. 322] Q Let me ask this general question while Warren is out of the room. When did you first get involved in this case?

A Approximtely two months ago.

Q And that was at the time that your –

A Maybe three months ago.

Q – employer, Mr. Edwards, got sick?

A Yes.

Q Did you get involved before he got sick?

A I may have reviewed the file to see what type of work he was doing. But I can't recall specifically.

Q So you don't know whether you did that general overview of the file before Mr. Edwards got sick?

A No, I don't.

Q And if you did review the file at that time it would have been just for a general overview of what type of work he was doing?

[p. 323] A Yes.

Q After he got sick you got involved in this case; is that right?

A That's correct.

Q What work have you personally done on this case?

A I have reviewed the file, reviewed the photographs. I've talked with Mr. Edwards at times. I've looked at the tires. The file had certain materials that I reviewed, as I mentioned, so – I've looked at some stuff this morning.

Q You looked at the tires this morning for the first time?

A I looked at the tires and I saw the accident report and saw some other information.

MR. JACKSON: He looked at the two accident reports, the one that Mr. Bowers did, the one the state trooper did. And I think you looked at the maintenance records.

THE WITNESS: Maintenance records.

MR. JACKSON: And we discussed briefly the testimony of sergeant whatever, one that did the inspection of the vehicle.

[p. 324] BY MR. BABINGTON:

Q Is there anything else, any other work that you've done on the case other than what's been mentioned by you or your lawyer?

A I believe that's all.

Q You said you talked with George Edwards about the case?

A Yes.

Q What did you talk with him about?

A Just the mechanics of the case. We talked many times about whether he'd be able to continue and decided that he couldn't.

Q Did you talk about the opinion that he had in the case at all?

A He asked me to look at the photographs and to come to my own opinions to see if I could agree with what he had determined at that time.

Q And based on your review of the photographs you were able to agree with his opinion, it appears?

A Pretty much.

Q Is there anything that Mr. Edwards thought that you disagreed with?

A Not for the major opinions, no.

[p. 325] Q Was there anything at all?

A The – he – there's one thing that we have not resolved. He believes that the fact – that the caps plies were not mentioned on the sidewall as required by the government and I believe that they're not.

Q Other than that is there anything that you and Mr. Edwards disagree about?

A No.

Q You read his report before you looked at the photographs; is that right?

A I think I looked at the photographs and then read his report.

Q Did you read his report before you made any preliminary analysis of what you thought?

A No, I think I came to my own conclusions based on the photographs and description of the tire.

Q Where is the description of the tire located?

A Well, the description found in the photographs.

Q So you based your conclusions totally on the photographs, that's it?

A That's right.

[p. 326] Q Nothing else?

A I believe that's true.

* * *

[p. 328] Q Have you done any tests at all on any of the tires on this vehicle at the time of the accident?

A No.

Q As I understand it you've inspected the tire and you did that for the first time this morning; is this correct?

A That's correct.

Q And that's the only time you've done that?

A Yes, sir.

Q And you inspected the other tires this morning as well?

A That's correct.

[p. 329] Q You've not inspected the van?

A No.

Q You've not visited the scene?

A No, I've driven through there many times but not inspected it.

Q You've not gotten out of your car and looked around the scene?

A No.

Q Have you reviewed any depositions?

A No.

Q Have you done any other work or analysis on the case other than what we've discussed so far?

A I don't believe so.

Q Have you asked for anything that you haven't received; for example, you asked to see a copy of a

deposition or some piece of evidence that you just haven't seen yet?

A I don't think I specifically asked for anything. I would like to have some copies of that eventually if you decide we need them.

Q Copies of what?

A Accident report and the depositions when they become available.

[p. 330] Q Are you aware that some depositions are currently available?

A No, I think there would be depositions taken of other experts and stuff like that.

Q Those are the only ones you would want to see?

A Well, I don't know of any others. I know there's a statement of a witness and I looked at that briefly. But I might like to look at that with more time.

MR. JACKSON: That was the guy's name starts with an M in Louisiana.

MR. BABINGTON: McCann.

MR. JACKSON: Malcolm McCann.

BY MR. BABINGTON:

Q You've looked at his statement or did Mr. Jackson read it to you?

A He read a certain portion and I scanned it briefly.

Q How long did that take?

A Five minutes.

Q Any other items that you've seen or reviewed that we haven't covered?

A Not that I know of.

[p. 331] Q Is there any work that you plan and you and Mr. Jackson discussed your doing in the future?

A We haven't planned anything at the present.

Q Can you give me your opinion about what you think happened in this accident?

A The tire separated causing the tread to flap, there was a catastrophic loss of air pressure, the tire was then essentially flat and caused the loss of control of the vehicle resulting in a turnover. In a nutshell.

Q Are you making any assumptions in stating what happened?

A Probably, but –

Q Do you know what those assumptions are?

A Just my assumption of what happened in the accident based on a quick scan of the accident report.

Q And you haven't done any accident reconstruction type work?

A No.

Q What is the basis for your opinion that there was a separation, that the tire separated?

A Examination of the tire.

Q And what in particular indicates that there [p. 332] was a separation to you?

A There was an extreme amount of polishing and the tire separated at the tread – tread belts.

* * *

Okay. These are the photographs that you've pulled out that indicate polishing; is that correct?

A Right. Let me check over this, some of them don't show up very well.

* * *

You did not take any of these photographs, right?

A That's correct.

Q And your determination that there was a [p. 333] separation, as I understand it, was made on the basis of these photographs that we've just identified?

A That's correct.

Q Before you ever saw the tire?

A That's correct.

Q All right. Now can you show for me, point out for me in the photograph, let's take them one at a time, where you say the polishing is? Let's take $2^{37}/_{38}$.

A The polishing in this one is important as you see polishing at the edges here and this surface here. This was the worst one, off the record.

Q Let's go to the next one, let's go to $2^{33}/_{34}$.

A That's polishing right here and this baring of the metal is also important. This is the polishing of the rubber and this is kind of like polishing of the metal. You see it over here also.

Q Are those the only two places on photograph 2 33/34 that there's polishing?

A There's instances of polishing in this area also but it is more or less isolated. There's some in there.

Q When you point to this area, you're pointing [p. 334] to the center?

A The center of the tread.

Q And when you indicated polishing earlier you were indicating it at the bottom of that photograph?

A Yes.

Q Above the – at the area where you can see the steel wire?

A Yes, this is the bottom of the tread element which includes the upper belt and the tread surface, tread rubber.

Q Is there any degree that you can assign to this polishing? I mean is it –

A It's very well developed in many areas.

Q Can you show me an area that you consider to be well developed?

A Right here.

Q And that's the area in the –

A Yes.

Q In the lower left quadrant of the photograph –

A Yes.

Q – 2 33/34?

A Now one measurement, if you like measurements, [p. 335] you can measure the amount of baring of the edge belts. This is one that I forgot to mention earlier today, but you can sometimes on certain tires measure how much of this edge belt has been bared or polished to where there's no rubber on it.

And at Michelin we had certain criteria for that. You can measure – see how much this is. This is mainly a separation in this product which I don't believe is a skimstock, but I think it's an extra product that is put between the belts to try to prevent separation. And I believe that is where the failure occurred at first.

Q The area that you're talking about in photograph 2 33/34 is the area where you think the separation of this particular tire started?

A That is the product, that's not the particular area in the circumference of the tire that it started, but that is where it developed as the tire – after the initial separation began.

Q I'm not sure I understand that. Is that where the separation started or not?

A It's where it started, where – where it started – it started at the edge of the belts, okay, [p. 336] in this product. If you extend this tread longways, I think it started initially in a different place and grew to this place.

* * *

Q Can the photograph itself, in the process of taking the photograph itself, you know, the flash, create different reflections on the surface of the rubber that could make your analysis on the basis of photographs uncertain?

A I think it could trick some people, and that's [p. 337] one reason you have to look at the tire eventually to confirm your results.

Q So just making an analysis based on photographs can be tricky because the flash of the camera can sometimes create some funny shadows and reflections on the surface of the rubber?

A It can make it look different, yes.

Q But you confirmed to yourself that this was, indeed, polishing?

A I saw what I've seen in hundreds of other photographs and I felt confident enough to come down here. If not Mr. Edwards would have been out a plane ticket.

Q Okay. If you'd decided that that was not polishing then Mr. Edwards would have been out a plane ticket?

A Yeah, probably.

Q How much does that plane ticket cost?

A Seven hundred dollars, something like that.

Q Okay. Next photograph is $2^{31}/_{32}$. Where is the polishing there?

A You see along this strip and along this strip and in other areas in there. You see it in the center [p. 338] also.

Q You are pointing to the areas that appear to be a little bit whiter –

A Yes.

Q – Than other areas of the rubber?

A Yes, the shininess makes them more reflective.

Q Is this material actually white or is that the camera doing that?

A No, it's brighter because it reflects more light. Surfaces that are shiny generally reflect more light than matte surfaces.

Q So is that an indication that the tire is white if we looked at it?

A No, it's an indication it's reflecting more light. It's shiny.

Q So the tire is not white?

A It's polished, yes.

Q The tire is not white?

A The tire is not white.

Q So this photograph $2\ ^{31}/_{32}$ which shows white, or appears to show white on the tire, isn't accurate in that respect that that is not actually white on the tire; is this correct?

[p. 339] A No, but you can have white in the photographic process from having more light, not from being

different color. You're, I think, in error assuming that, you know, because it looks white that it means that the tire is white. It just means that the surface is reflecting more light. There's color and intensity of light.

* * *

[p. 341] Q Were you able to determine from looking at these photographs where you thought the separation started?

A Well, at the belt edge.

Q Were you able to determine with anymore specificity what part of the belt edge? I mean did it start at a particular spot on the tire?

A It looked like there was a place that it started and generally you believe that where the abnormal wear is that that's where it's been there the longest.

Q Where the abnormal wear is, what do you mean by the abnormal wear?

A The tread will be worn more at one place than the other.

Q Are you talking about external tread?

A Yes, the other side of this.

Q Can you show me in these photographs that you've indicated show the polishing where that point on the tire is?

[p. 342] A I don't think I can correlate these photographs to that point.

Q Is it significant in tire failure analysis to be able to come up with the point where the tread separation started?

A Not really.

Q That's something that's not important?

A It's important to some people but –

Q Not important to you?

A It is important where it starts as a product, where it starts there. In the circumference of the tire it's not that important.

Q Will any of the other photographs show where it started?

A I think that 2 19-20 shows the approximate area but I'll have to look at the tire to be sure.

Q Is that where the white mark is on the tire?

A Yes.

Q And that is the area that you believe is the location of where the separation started?

A I better correlate that with the tire.

* * *

[p. 343] Q Let me ask you this, you did not have the tire when you first made your opinion in this case; is that correct?

A That's correct.

* * *

[p. 345] You've got the section you're looking for?

A Yeah. That was at that point, I believe. This is where the wear is most extreme. You have abnormal wear on that shoulder. So I believe that the separation started on this shoulder. It started in this point, because the wear is the most extreme, and that the separation occurred here for the longest period of time or longer period of time.

* * *

[p. 346] Q Parts of the exterior tread of this tire have been lost; is this correct?

A I believe so.

Q Does that make it more difficult to do tire failure analysis?

A Sometimes.

Q In this case does it?

A I don't think it hurts too much.

Q It hurts some?

A It doesn't appear – there are so many indications of what happened, I don't think it hurts.

* * *

[p. 347] Q Right in there. And does that continue around the circumference?

A Pretty much, yes. Yes, it does and that was done in the accident.

Q It's your opinion that the bead impression on this side of the tire, the white wall side of the tire was as a result of the accident?

A Yes.

[p. 348] Q Was not caused before the accident by overdeflection?

A That's correct.

Q What do you base this on?

A The other side has no significant impression. You see a tiny mark every now and then. Let's see, where was I? Losing it in the shadow here. See, there's no well-developed mark. There's a slight indication of a minor one right around here.

* * *

[p. 349] Q Let's use black wall and white wall. On the black wall side what you're saying is there is no bead groove impression?

A There is no significant bead groove impression.

* * *

Q Can you have bead groove impression on one side of the tire but not on the other in an overdeflection situation?

A Generally not.

Q You said generally not; can you in any circumstance?

A I haven't seen it. Yet if you had a suspension that caused the tire to lean a considerable [p. 350] amount then it's theoretically possible that you would have that. But –

Q Do you know if that exists on this van?

A It does not exist. It's a solid rear axle in the rear.

• • •

A That's right.

Q And you rub your hand on it and you can feel that?

A That's right.

Q What is that caused by?

A Well, it was overdeflected after the tire blew out and it pressed against that.

• • •

[p. 352] Q Where is the nail hole penetration with respect to the area where you said that the separation started?

A In a different area of the tire, circumference of the tire.

Q Is that of any significance to you?

A Well, there's no indication that the nail hole had anything to do with the separation.

Q What would you look for to try to determine whether it did?

A Well, when it does you see extreme polishing around the nail hole where a separation –

Q Was there any – I'm sorry, were you finished?

[p. 353] A Where the separation occurred.

Q Any other evidence you would look for around the nail hole?

A Well, you would look to see if there was any filling material in there but mainly you see a very clear separation proceeding from the nail hole polishing.

Q Do you see any polishing around the nail hole in this tire?

A No significant polishing.

Q You do see some?

A It's in some area nearby but it started on the other side of the tire.

• • •

[p. 355] Q Is there any fill material in there?

A I've not probed it, it does not appear to be fill material.

• • •

[p. 356] Q Do you have any opinion about how many pounds per square inch of pressure that tire would lose with a nail in it per week?

A Not an exact number.

Q Give me your best judgment. If a nail –

A Well, most of the tests I've done have been on [p. 357] larger size objects, so I don't know. If the nail were in there and it were in there flat with very little damage, I don't know. I may try to research that.

Q What about if the nail or penetrating object wasn't in there?

A If you're saying that that hole existed all the way through the inner-liner and there was no nail in there?

Q Right.

A The tire would deflate in a matter of minutes.

Q With the nail in there you can't quantify how fast the tire would deflate?

A I would think it would be something on the order of three PSI a week, but my measurements are usually with bigger nails. I don't know what this one would be.

Q But that's your best ballpark estimate at this time; is that correct?

A At this time I prefer not to give an estimate but that would be my best guess if I were forced to.

Q When you hold this up to the light and look at the nail hole you can see light all the way through?

A That's correct.

* * *

[p. 359] Q So even if the person who repaired the tire had failed to put the fill in the exterior part of the tire on the tread side, you don't think that was significant in the cause of failure of this tire?

A No, there's no indication that it progressed from that point.

* * *

[p. 360] Q Okay. Now you've also mentioned that there is a chemical cure patch that was placed on the inner-liner?

A Yes, sir.

Q Do you know who applied that?

A No.

Q Have you been told?

A No.

Q Do you know when that was applied?

A No.

Q In your report you say that that was satisfactorily done. What do you base that statement on?

A It stuck well.

Q Anything else?

A It appears to be prepared well.

Q Did you test to see if it held air?

A I don't know of a test to do that.

* * *

[p. 362] Q Well, I guess what I'm having a hard problem with on that is absent some type of test to determine that it does hold air, it doesn't leak, how can you be sure?

A Well, how is it going to leak? It's got to leak either in the bond or it's got to have a hole in [p. 363] it.

Q Well, is it possible that it might have a microscopic or small hole that would cause it to leak that you wouldn't see?

A It's not probable.

Q Well, have you ruled that out?

A Yes.

Q How did you rule that out?

A By examination and feeling.

Q With respect to the rim flange impressions that you talk about, you state in your report that you believe those were normal in your opinion?

MR. HERLONG: You say report, are you referring to interrogatories?

BY MR. BABINGTON:

Q Yes, I'm talking about interrogatory answers, Defendants' Exhibit 2 to your deposition.

And let me ask you this, let's talk about Defendants' Exhibit 2 before I go on with that. Is the language that is used in Defendants' Exhibit 2 language that you provided to the plaintiffs' lawyers. Is that your language?

A I think most of it is our language.

[p. 364] Q Our language, who do you mean our language?

A Edwards and I.

Q Did Mr. Edwards write that language or did you write it?

A He wrote it first and reviewed it.

Q And you adopted it?

A Yes, sir.

Q So just so we're clear, what's on Exhibit 2 was initially written by Mr. Edwards before you even got involved in the case?

A That's correct.

Q And then after getting involved in the case you just adopted what he said?

A Yes.

Q Did you review it and adopt it before you came down here today to give your deposition?

A Yes.

Q And that was before you saw the tire?

A That's correct.

* * *

[p. 367] Q Do you know how many miles of service this tire had seen before separation started?

A No.

Q You will admit that it saw thousands of miles of service; is that correct?

A I believe it did.

Q Can you quantify for me how many miles of service it saw?

A No, I haven't put a number on it.

Q Was it more than 10,000?

A Could be.

Q Was it more than 20,000?

A I don't know.

Q Was it more than 30,000?

A There's a chance.

Q Was it more than 40,000?

A I don't know.

Q Was it more than 50,000?

A I don't know.

Q Well, you indicate in your report that the remaining tread depth is approximately 3/32 of an inch; [p. 368] is that correct?

A That's correct.

Q The initial tread depth, I think you said earlier was, you think, for this tire 11/32 of an inch?

A Yeah.

Q And the tire should be taken out of service, in your opinion, when it reaches 2/32 of an inch?

A That's correct.

Q So this tire was just about ready to be taken out of service –

A That's correct.

Q – at the time it failed; is that correct?

A Yes.

Q Do you know whether the tire had been driven more than a thousand miles?

A I would imagine so.

Q More than 2,000?

A Of course.

Q More than 3,000?

A Yes.

Q 4,000?

A Yes, I think so.

Q 5,000 miles?

[p. 369] A Yes.

Q 6,000?

A I would think that's about it.

Q That's about how far you can say with any certainty?

A That's right.

Q Have you reviewed the plaintiff's deposition with respect to the use that he put on this tire? Do you know how many miles he drove it?

A No.

Q Do you know whether he purchased the tire new or not?

A I think it was purchased on a used vehicle.

Q Do you know how many miles the plaintiff drove the vehicle after he purchased it?

A No.

* * *

[p. 371] I, Marie Garofalo, do hereby certify that the above and foregoing transcript of proceedings in the matter aforementioned was taken down by me in machine shorthand, and the questions and answers thereto were reduced to writing under my personal supervision, and that the foregoing represents a true and correct transcript of the proceedings given by said witness upon said hearing.

I further certify that I am neither of counsel nor of kin to the parties to the action, nor am I in anywise interested in the result of said cause.

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[p. 373] CARMICHAEL/CARLSON VOL II.

The continuation of the deposition of DENNIS P. CARLSON, JR., taken at the law offices of HELMSING, LYONS, SIMS & LEACH, 2000 LaClede Building, 150 Government Street, Mobile, Alabama, on the 15th day of May 1995, commencing at approximately 1:10 p.m.

[p. 374] APPEARANCES

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[p. 375] INDEX

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[p. 378] DENNIS P. CARLSON, JR.,

the witness, after having first been duly sworn to tell the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

EXAMINATION

BY MR. BABINGTON:

Q Mr. Carlson, this is the continuation of your deposition in the case of Carmichael versus Samyang Tires, Inc., et al., and you've been resworn to tell the truth; is that correct?

A Yes.

Q I wanted to ask you a couple of questions starting out about your theory of tire failure analysis generally. How do you go about doing a tire failure analysis?

A Are you talking about my present position?

Q Yes.

A Okay. We generally look at the tire and take pictures and decide if there is further analysis that's needed.

Q That's it?

A Some tires require further analysis.

Q How do you determine if a tire needs further [p. 379] analysis?

A Some tires require x-rays, some require decortication, some require chemical analysis.

Q And how do you make the determination whether to perform this further analysis?

A It depends on the type of failure.

Q You mentioned that in some instances you believe a tire should be x-rayed; is that correct?

A There are occasions that you need x-rays.

Q When would you want to do that?

A When I see – well, in some bead cases, of course, when you have bead breakage you need x-rays. When there are tires that have serpentine belts, x-ray can prove helpful in those cases.

Q Any other cases where you think x-rays are needed?

A Well, I've used them for sidewall failures. And that's the three areas of the tire: the sidewall, the bead, and the tread area.

Q You have not done x-rays in this case; is that correct?

A No.

Q Do you feel it's necessary to do x-rays in [p. 380] this case?

A No.

Q Now you also mentioned in some cases you would decorticate the tire?

A Yes.

Q What cases would you do that in?

A I have some cases where the bead is assembled incorrectly and many times the only way you can tell that is to cut the tire.

Q Any other such cases where you would want to decorticate the tire?

A Well, also you decorticate in the sidewall sometimes to see the deterioration of the sidewall. And you also do it in the tread sometimes, to see – in certain cases you have to see how the belts are laid.

Q Now you haven't cut up the tire in this case?

A No, I have not.

Q Do you feel that is necessary in this case?

A I – there is one question I would like to look at. I may be able to get it from specifications, but I would like to cut the bead of this tire.

Q Why?

A I want to see if they used a protector.

[p. 381] Q What type of protector?

A They're usually nylon or polyester for passenger tires.

Q What significance would that have to you?

A I believe that the rubber was laid thin in one area of this tire without a protector.

Q On the bead?

A Yes.

Q Other than looking at that bead area through this process of decortication, is there any other area of this tire that you feel needs to be cut and looked at that way?

A No.

Q You wouldn't cut the sidewalls or the tread area in this case?

A I don't think it's necessary.

Q Well, would cutting the tire reveal any additional information or facts that are not available just upon a physical examination of the exterior of the tire?

A There may be something there but I don't know, I can't predict right now.

Q What would you be looking for in the sidewalls [p. 382] of the tire if you cut those?

A I'd be looking for the lay of the carcass plies, the way it was constructed.

Q What significance would that have?

A Well, I believe that this is what we call a triangular construction where the carcass plies separate above the bead and one comes around and turns up – the inside one comes around the bead and turns up and the outside one – the upper one comes on the outside of the – what we call the BT or the triangular flipper, sometimes called the flipper. It's a fairly common construction.

Q So there's nothing unusual about the design of the carcass of this tire?

A Well, I don't know what the exact design is but I'm pretty sure that this is that design based on what I see here, and there's nothing too unusual. But a bead design, it depends on a lot of subtle things.

Q What was that last part? I'm not sure I caught that.

A Subtle things.

Q The bead design depends on a lot of subtle things?

[p. 383] A Yes.

Q What do you mean by that?

A Well, the nuts and bolts of how you put things. You know, you can – a lot of people do this same type of

construction but they make mistakes in just the details. In other words, talking about a difference between a micro and a micro description.

Q Do you have any criticism of this type of design?

A Not what I know of it now, except that it looks like a production defect may have occurred in this.

Q Well, answer my question. Are you critical of the design of this tire?

A If it is what I suppose it is, the general description of it is not something that is unusual.

Q That's not my question as to whether it's unusual. Let me ask it this way: Do you believe this is a defectively designed tire?

A Well, I don't, at this point. If I cut it, there may be something I could criticize. But I see only evidence right now of, perhaps, thin rubber.

• • •

[p. 385] You also stated that under certain situations you recommend doing chemical analysis?

A Yeah.

Q Is this one of the cases where you think you need to do chemical analysis?

A No.

Q What case would you do chemical analysis in?

A Most common thing we do is where we're trying to compare tires that may have one specification to tires

that are produced at a different time. And we're trying to show that they may be a common green tire or a common design, a common rubber product.

Q Why would you want to do that?

A Well, so that the information that we have on one tire can be applied to another.

• • •

[p. 386] Q Is there any other reason why you would do a chemical analysis in tire failure analysis?

A Well, there are certain types of contamination, I mentioned before butyl contamination. That's about the only contamination that's still left after the tire is cured and separates.

Q And you don't feel it's necessary to do that in this case?

A No.

Q You don't have an opinion that butyl contamination occurred in this case?

A It could have been.

Q Well, I'm not asking what could have been. Do you have that opinion that butyl contamination occurred in this case?

[p. 387] A It's a possibility.

Q It's a possibility. It could have been is not good enough. Do you or do you not have that opinion that butyl contamination occurred in this case?

MR. JACKSON: What do you mean it's not good enough? Good enough for what?

MR. BABINGTON: I don't think it's good enough as far as testifying.

MR. JACKSON: That's your opinion. I mean if he says, "No, it's not," then he's foreclosing the possibility that it might be there. I think what he's saying is he does not have enough factual information to make that opinion but he doesn't want to foreclose it.

BY MR. BABINGTON:

Q Is that what you're saying?

A I believe so.

Q So with respect to the chemical analysis to determine if there were some butyl contamination in this tire, what you're saying is you haven't done that type of a test, so you don't know whether it occurred and you don't have any opinion one way or the other about whether there is butyl contamination?

[p. 388] A I don't have a definite opinion that it was but it's one of the possibilities.

Q Well, if you haven't done the test and you say it's one of the possibilities, how can you – I mean sure it's one of the possibilities, but I guess what I'm asking you is, without having done the test, you don't know one way or the other, do you?

A That's correct.

Q Is there any other chemical test that you would perform in tire failure analysis that you haven't mentioned?

A I don't think there are any that would apply to this case.

Q Getting back to where we started, you said first you look at the tire and you take the photographs of the tire, then you decide if further analysis is needed. Now as I understand it, the way you did it was you looked at photographs of the tire, the ones that are marked as Defendants' Exhibit 5; is that correct?

A That's correct.

Q First. And then you didn't see the tire until shortly before your last deposition was given on March 7, 1995; is that correct?

[p. 389] A That's correct.

Q And as I understand it, you haven't performed any further analysis of this tire?

A That's correct.

Q As far as your tire failure analysis goes with respect to determining whether there was a manufacturing or design defect as opposed to some other cause of failure of a tire, as I understand what you've told me earlier, what you do is that you presume that there is a manufacturing or design defect and your opinion will be that that is the cause of failure of the tire unless you can find some evidence, some affirmative evidence, pointing to abuse being the cause of failure of the tire.

A Well, as we've said before, I don't go along with that characterization.

Q Well, describe to me in your own words then how you do that.

A Well, in a separation case, you find out if there are factors that explain it by abuse. And if you eliminate those causes, then it's a manufacturing or design defect.

Q And describe for me how you eliminate the [p. 390] factors of abuse.

A Well, there are the abnormal wear, there's the signs of running flat or underinflated, and there's the bead compression grooves.

Q When you say the signs of running flat or underinflated, would that be the sidewall deterioration or abrasions?

A Yes.

Q And I think the last time you mentioned, as well, there being some indication that can exist on the rim flange itself; is that correct?

A Yes.

Q Would that be a fourth factor?

A That can be one. It's – there's various marks on the rim, and a lot of people have different opinions on it. I think the tire is a better indicator.

Q So what you're doing when you're talking about a separation case like this case, you're talking about looking at the tire and determining if any evidence exists

in the tire of abnormal wear pattern, sidewall deterioration or damage, or bead grooves, and in some instances rim flange impressions. And if you can find [p. 391] evidence of those in the tire, then that is evidence of overdeflection of the tire, abuse of the tire, that would point to that as being the cause of separation; is that correct?

A In most cases, yes. But as I said before, you have to look at every one very carefully because, for instance, in this tire there's one shoulder that is slightly worn more than the other. And this is not – and more than the center. And this is probably the result of the separation and not any kind of abuse factor.

Q What you do is you look at those items that you mentioned to see if they exist and, if they exist, that is evidence of overdeflection, abuse of the tire, and points to overdeflection and abuse of the tire being the cause of the separation; is that correct?

A It can be; they have to be evaluated.

Q I realize that, but if they exist, those items you mentioned – wear pattern, sidewall deterioration or abrasions, the bead grooves, the rim flange impressions – if those exist in a tire, that is evidence of overdeflection, abuse of the tire; is that correct?

[p. 392] A They certainly can be.

Q And as I understand what you do in your analysis in determining the cause of failure, the cause of a separation of a tire, is if you cannot find those or if they're present but you just believe they weren't caused by overdeflection, then you presume that the only other

reasonable explanation is a manufacturing or design defect and hence you conclude that that must be the cause, the manufacturing or design defect?

A Well, besides nuclear war that's about all there is that causes tire failures.

Q We're not just talking about tire failures, because I think we went over that before and there are a lot of causes. We're talking about separations here, let's keep on that.

A That's right.

Q In a tire failure analysis in a case where you have a separation, as I understand, what you do is, if you can't find these evidences of abuse through overdeflection or if in your opinion you find insufficient evidence of it, then automatically the only conclusion that can follow is that it was either a design defect or a manufacturing defect; is that [p. 393] correct?

A That's pretty correct.

Q Let's talk about, for a second, why tires come out of service. And I would like to draw a distinction in these next couple of questions of tires coming out of service versus tires failing. Okay? And as I understand the way you've said tires come out of service, most tires come out of service because the tread wears out, right?

A Yes.

Q Most tires do not come out of service because of some design or manufacturing defect?

A I don't think so.

Q Now just looking at those tires that fail or come out of service before their tread wears out, okay, most of those tires fail, isn't it true, because of some type of abuse, such as punctures, impacts, cuts, being run flat, overdeflection, and all the other ones that we've mentioned. Do you agree with that?

A There's a lot of tires that do that, yes, sir.

Q Would you agree that that's the majority of tires that fail before the end of their tread life, fail because of factors of abuse, being those that we [p. 394] defined before?

A Oh, yes.

Q And that only, in your opinion, only a small percentage of tires that fail before the end of their tread life do so because of some design or manufacturing defect?

A That's correct.

Q Do you have any percentage that you can pin on that last category; that is, the percentage of tires that, in your opinion, before the end of their tread life fail due to design or manufacturing defects?

A The highest data I've seen is approaching 20 percent.

Q What's the lowest you've seen?

A Well, the best manufacturer has an adjustment rate which is less than half a percent.

Q And this data you've just given me, where did that come from?

A The cases I've worked on. Some of it was Congressional testimony.

Q What was the occasion for the Congressional testimony; do you recall?

A No, I don't.

[p. 395] Q Who was that testimony given by?

A The different tire companies.

Q When? Do you recall?

A It was approximately, let's see, I believe it was '79 or '80.

Q And the numbers that were mentioned is that for tires that come out of service or fail before the end of their tread life, the best manufacturer's experience was one-half a percent –

A Yes.

Q – fail due to design or manufacturing defects and the highest figure mentioned in that testimony was 20 percent?

A Okay, the 20 percent came from a different source.

Q Where did that come from?

A It's some data that is under a protective order from another case.

Q Did you develop that data or did someone else?

A (Witness shakes head negatively.)

Q You're shaking your head no?

A I'm sorry, it came from somebody else.

Q What do you feel? What in your experience is [p. 396] the percentage of those tires that fail before their tread life ends due to some design or manufacturing defect?

A Let me qualify the one-half percent first. That is tires that were adjusted by the manufacturer. And that's probably a small percentage of tires that people had trouble with. These are tires that would be – have complaints, you know, from ride to handling or separation or something like that.

There is – there would be – I have seen some data about how many tires would come out before the end of that, and I can't remember what they were right now. I'll try to find that paper.

Q Well, do you have any personal opinion or experience or knowledge as to what number of tires or percentage of tires which fail before the end of their tread life do so because of some design or manufacturing defect?

A Oh, design or manufacturing?

Q Yes.

A Overall, it – I don't have an idea. The general industry guideline is an adjustment rate of 1.5 percent.

[p. 397] Q Do you have any reason to dispute that?

A It – I think that that's a dangerous number to, you know, to bandy around. Some manufacturers, that one

and a half percent is all separations, and some of them it's all ride complaints. So it doesn't really tell the story. It's just a statistic.

Q A ride complaint wouldn't necessarily be indicative of a manufacturing or design defect, would it?

A Most likely it is.

Q Could be that just the tire didn't suit the people who were using it, they didn't like the way it rode on their vehicle, their particular vehicle?

A Could be a lot of things, yes.

Q Right. But the compatibility of the tire for the vehicle and the people driving it could be one of the reasons why you have a handling complaint, correct?

A Well, there's a lot of things in ride complaints. Most of those are vertical force variation. And that can be a separation developing, it can be a wheel weight that just fell off.

Q Well, the point being is that a ride complaint can be something other than an indication of a design [p. 398] or manufacturing defect; would you agree with that?

A It can, but quite often it's a manufacturing defect. Or, see, different manufacturers have different levels of radial force variation controls.

Q Now, you said that the industry guideline was 1.5 percent?

A That's a number I hear very often.

Q Do you have any reason to dispute that as being a reliable number?

A Well, that's mainly an industry number, it's not my number.

Q What is your number, do you have a number?

A Well, I would like to see everybody around a half percent or less.

Q Well, my point being, this is experience that this number presumably is based on. Do you have a number of what the actual experience is out there in the real world of tires that come out of service before the end of their tread life due to a manufacturing or design defect?

A Well, what the one and a half percent is is adjustment data. Most adjustments occur in the first two years. After two years, people don't bother to [p. 399] bring their tires in when they have something wrong with them.

Q Well, what I'm asking you is not that; I'm asking do you have a number that you can give me as to the percentage of tires that come out of service due to a design or manufacturing defect before their tread wears out?

A No.

Q So you don't have any basis to dispute the industry guideline that you mentioned that says that you have 1.5 percent adjustment?

A The 1.5 percent adjustment is the industry guideline of what the industry would like to see tire companies under. That is what is economically feasible for them and as a public relations and it suits their quality image or whatever.

Q Is that industry guideline an experience level or is that just something that people hope to reach or do you know?

A The best way to qualify that, from what I understand the industry uses it, is they say that any company that adjusts over 1.5 percent of their tires is in trouble.

[p. 400] Q What do you base that statement on?

A From what I've learned being in the industry. At the time that one company had a half a percent adjustment rate, most of the companies in the United States were at 5 percent adjustment rate, in that Congressional testimony.

Q What was the company that was at one-half percent adjustment?

A Michelin.

Q In any event, as I understand what you're saying, you agree that a very low percentage of tires that fail before the end of their tread life fail because of a manufacturing or design defect?

A Very small percentage fail due to separation, which is a manufacturing defect.

* * *

[p. 401] Isn't it true that a very low percentage of tires that fail before the end of their tread life, fail because of some manufacturing or design defect?

A I think you left out something in the English, but yes.

Q Now if that is true, isn't that inconsistent and not in keeping with your tire failure analysis method in which you reach the conclusion that there is a manufacturing or design defect unless you can rule out abuse?

A Not at all.

Q Why not?

A It's going to be one or the other.

Q Well, shouldn't the presumption be the other way around? For example, shouldn't it be that you presume the tire is correctly made and has no manufacturing or design defect unless you can affirmatively show that it does have a manufacturing or design defect?

A As I said in one of the other depositions, that's essentially what we do. The great majority of the tires that we see get sent back without a, you [p. 402] know, without developing a case.

Q But your method is you look at the tire and, in essence, you presume the tire guilty; you say there is a manufacturing or design defect unless there's some evidence that, in your opinion, unequivocally points to abuse in the form of overdeflection being the cause of the separation.

A A tire will fail because it is a bad tire or it's been abused. If you find the abuse factors, then it's not a bad tire.

Q And if you don't find the abuse factors or the evidence on the abuse factors is inconclusive, then what do you do?

A Well, then it's probably a bad tire.

Q Probably a bad tire?

A Yes. And you got to look and see.

Q I guess then it all comes down to the subjective opinion of whoever is doing the tire failure analysis as to whether those factors of abuse you've listed – the wear pattern, the sidewall damage, the bead grooves, and rim flange impressions – exist in a given tire?

A Well, it's subjective if you have the [p. 403] knowledge and experience to analyze those factors.

Q Well, let's talk about wear pattern for a moment. As I understand what you've said, when you're looking in tire failure analysis where you're trying to determine the cause of a separation of a tire and you are looking at the wear patterns, what you're looking for is shoulder wear that is more severe than center wear; is that correct?

A Generally, yes.

Q All right. Now, let's talk about this tire. Does this tire have shoulder wear that is more severe than the center wear?

A One shoulder is just a little bit more than the center and the other shoulder.

* * *

[p. 407] Q Are there any variations circumferentially in the tread depth on the black-wall or serial number side of the tire?

A It's fairly constant.

Q But by you saying "fairly constant" denotes to me there may be some variation; is that correct?

A There's always a little bit of variation circumferentially.

Q Can you quantify how much that is?

A It's usually less than a millimeter, so –

Q Were these your measurements or were these measurements taken by Mr. Edwards?

A I believe these were taken by Mr. Edwards but I did it also.

Q When did you do it?

A I guess the first time I saw it.

Q Which would have been last March 7th, shortly before your deposition?

A Yes.

Q Do you have any notes of your measurements?

A Just verifying what was in the photographs, I have a sheet here where I prepared summary and it has [p. 408] those measurements.

* * *

[p. 409] Q Did you make any measurements on the shoulder area on the whitewall side where you said it was worn? Did you make any measurements of what the tread depth was there?

A It varied from 3/32 to zero.

Q So there are some areas where the wear is zero, the remaining tread depth on this tire is zero; is that correct?

A Yes.

* * *

[p. 410] Q Do you know what the initial tread depth was on this tire?

A No.

* * *

Q Based on comparison of the initial tread depth with the remaining tread depth, you agreed earlier that this tire had seen thousands upon thousands miles of use?

A It had seen some good wear.

[p. 411] Q And would you agree that it was near the end of its tread life?

A Certainly.

Q It was within the last 10 percent of its tread life?

A Probably.

Q And your opinion, as I understand it, is that there was a manufacturing or design defect present in this tire since the date of manufacture?

A Yes.

Q And what you say that defect was, as I understand it, is an insufficient adhesion or lack of adhesion?

A Yes.

* * *

[p. 412] Q Now you've said that the separation begins only shortly before the failure but that separation builds on some defect that existed from the beginning?

A That's right.

Q Is that what you're saying?

A That's correct.

Q If the defect that you say exists is present since the date of manufacture, how do you explain that the tire didn't fail earlier, that the separation didn't start earlier?

A The defect is insufficient adhesion. When you say insufficient adhesion, it means that it cannot last very long. It may stick together but it's not stuck together well enough to last through its normal life. At some point they do not stick together at all and that's when your separation becomes something that [p. 413] grows.

Q Well, this adhesion stuck together for thousands upon thousands of miles of use of this tire. You don't dispute that?

A That's true. It just didn't last long enough.

Q And earlier you said you didn't have any opinion as to the mileage that was put on this tire. Is that still true?

Have you done any further work or do you have any difference of opinion now compared to your first deposition as to the miles that this tire was driven?

A Mileage can vary so much I can't really put a number on it.

Q I think earlier you gave us a range where you believe that it went at least 6,000 miles but beyond that you couldn't go any further; is that still your opinion?

A Probably it went at least 6,000 miles.

Q Can you give us any more definite range than saying it just went 6,000 miles probably?

A I don't know what the normal mileage is, if there is any such thing as a normal mileage, for this tire.

[p. 414] Q One of the things that you said would be appropriate in looking at wear patterns of the tread would be to look at the other three tires and to see what the wear patterns on those tires was.

A Yes.

Q Have you done that in this case?

A I looked at them, yes.

Q Are there any wear patterns of significance to you on those tires?

A I don't recall significant wear pattern.

Q Well, the tires are here.

A Let's look at them.

* * *

[p. 416] Q Okay. The reason we got these tires out was to look at the tread wear. Do you see anything significant about the tread wear on this tire?

A Slightly worn more on the shoulder, and in the center it's very even and flat.

* * *

[p. 418] Q So there is more wear on the whitewall shoulder of this tire; is that correct?

A Yes.

Q And by this tire we're talking about the Hercules DSR II which you say was manufactured by [p. 419] Cooper?

A Yes, if I recall correctly, this is a Cooper tire.

* * *

Q Is that significant to you in your analysis?

A There could be so many different things that could cause that.

Q And one of the things could be overdeflection?

A Well, I think you would see a lot more. But a [p. 420] slight amount could be, yes.

* * *

Q So this tire is worn out?

A It's very close.

Q Well, is it worn out or not worn out?

A Well, I think you could run it just a little bit longer but I don't like to run my tires that long.

Q Would you run this tire on your car?

A No.

* * *

[p. 421] Q In your opinion this tire should have been taken off the van before the accident?

A Legally, it is not worn out.

* * *

Q In your opinion, though, you believe that a prudent individual should have taken this tire off his car –

MR. JACKSON: Object to the form.

BY MR. BABINGTON:

Q – before using it any further?

MR. JACKSON: Same objection.

[p. 422] THE WITNESS: By the industry standards, it's not worn out.

* * *

[p. 423] Q Would you place this in the same category as the Kumho manufactured tire that's at issue and say that it went at least 6,000 miles?

A I haven't compared the two tires, the wear ratings or anything. It's probably the same type of tire. If it's the same type of tire, it would be in the same order of magnitude.

Q So is that a yes –

A Yes.

Q – that you believe it went at least 6,000 miles?

A Yes.

Q But beyond that you don't feel comfortable being more specific?

A Well, without very careful analysis of what these people, how they drove, it's very hard. Even then it's very hard to determine mileage.

Q On the Kumho manufactured tire, the Hercules [p. 424] Superior XII tire, would you have taken that tire out of service before?

MR. JACKSON: Are you asking him personally?

MR. BABINGTON: Yes, you personally.

MR. JACKSON: Object to the form.

THE WITNESS: If I had inspected it, yes, I would.

BY MR. BABINGTON:

Q Why?

MR. JACKSON: Same objection.

THE WITNESS: There was a bald spot.

* * *

Q Do you believe that a prudent individual should have taken that tire off his vehicle before this accident?

[p. 425] A I don't think there's very many people that know when you're supposed to take tires off and that's one reason they put wear bars in there.

Q That tire had spots that were worn to 0/32, didn't you say earlier?

A Yes.

Q And that was below the industry standard for when a tire should be replaced?

A I think it would be – the standards for the industry, yes. I think most people would look at that and say there's still tread on it enough to wear, because they wouldn't think that one bald spot would be enough to cause them trouble.

Q But under the industry standards, the Kumho manufactured tire, the Hercules Superior XII, should [p. 426] have been taken off because the tread was worn out?

MR. JACKSON: Object to the form. Are you talking about that one bald spot, because of that?

BY MR. BABINGTON:

Q Talking about the area that he identified previously. You can answer.

A I think with industry standards that would be reason to take it off.

Q Let's talk about this other tire over here, I think these are Sears manufactured tires. I don't know if they made them, but they sold them. Guardsman. Who makes these tires?

A I have it in my notes, I think it was Armstrong. Yeah, Armstrong.

Q Did Armstrong make both of the Sears Guardsman tires?

A Yes. They have the same DOT number, they were made the same week and year.

Q Let's look at the one that someone has marked P-810-RF. Does that stand for right front?

A Yes.

Q Is that Mr. Edwards' mark on there?

A Yeah.

[p. 427] Q Is there any significant wear to the shoulder of this tire?

A Okay, you have one shoulder that's worn somewhat more than the other, somewhat more than the center.

* * *

[p. 430] Q As far as the tread depth in the center versus the tread depth on the shoulder of this tire, would you [p. 431] agree that there was greater tread depth at the center than at the shoulder?

A Yes.

Q Do you have any measurement as to what the difference is or any opinion about what the difference is?

A I don't recall what it is.

* * *

[p. 432] Q Do you know whether the Hercules tires, either the DSR II or the Superior XII, were ever on the front of this vehicle?

A I don't know.

* * *

Q Let's talk about this last tire here before we get up. This is the Sears Guardsman or Sears Response XL.

A Okay.

Q Has number P-810-LF, which I take it means left front; is that correct

A Yes.

Q Was that where this tire was located at the [p. 433] time of the accident?

A As far as we know.

Q Do you see anything significant about the tread wear on this tire?

A Well, it again has a little bit more wear at the edge than the center. It looks like it's worn a little bit more evenly than the other Guardsman.

Q It's worn more in the whitewall side shoulder; is that correct?

A Yeah, the inside.

Q What is the remaining tread depth there?

A Well, in some places it's worn a little more than others. In a few places it looks like it would be to the 2/32 mark.

Q Which would be below 2/32 remaining tread depth?

A Yes.

Q And again this tire has greater tread depth in the center than on the shoulder; is that correct?

A Yes.

* * *

[p. 435] Q Would the fact that the front tires, in your opinion, have greater wear on the shoulder than in the center have any significance to your analysis of the tire that failed?

A No.

Q None whatsoever?

A Well, it's something you have to look at.

Q Does that indicate to you that the vehicle operator, or whoever owned the vehicle before during it's life while these tires were on there, may not have paid particular attention to the inflation level of the tires?

A It does not indicate that.

[p. 436] Q Why not?

A Because this could be, being on the front axle, it could be – the steering axle, could have been caused by that. Improper alignment, characteristics of suspension. The other rear tires is a different wear pattern. Even though it's worn more on the shoulder, it has a different wear pattern. The accident tire has a classic wear pattern of a separation.

* * *

Q Going back to the Kumho Superior XII that's at issue in this case, the area of wear where the remaining tread depth is zero, you know the area I'm talking about?

A Yes.

Q Do you have any judgment as to how long that was present?

A It's very hard to put mileage on that but it would be for some period of time.

Q Well, that's what I want to know. Do you have a judgment as to what that period of time was or an [p. 437] opinion about that?

A Well, considering that it's probably 20 percent more worn than the rest of the tire, it doesn't take that very long to develop that kind of inequality.

Q Can you be more specific?

A No.

Q Was it a matter of less than 2,000 miles?

A It could be. Could be more.

Q Beyond saying it could be less than 2,000 miles and it could be more than 2,000 miles, do you have any judgment or opinion about how long that worn area would have been present?

A I think any number that would be more rigid would be a guess, so –

Q Can you put an upper and lower range on it for me as far as number of miles that that would have existed?

A No.

Q So it could have existed there for 30,000 miles then in your opinion?

A If the tire lasted a hundred thousand, maybe.

Q Could have been there for ten miles in your opinion?

[p. 438] A I'm not going to guess. As we said before, some of these things go fast and some go slow.

Q Well, what determines if it goes fast or slow?

A How bad or good the tire is and the usage.

Q Do you know what the usage of this tire was?

A No.

Q You haven't been given any facts about that?

A No.

Q So about as far as we could get on this line of questioning is that you really don't have any opinion or any judgment about how long that worn area would have been present?

A No.

Q Let's talk about the sidewalls for a moment. This is another area that you're looking at to determine if there's evidence of abuse in the form of overdeflection; is that correct?

A Yes.

Q Is there any evidence on the sidewalls to indicate that this tire was overdeflected?

A No.

* * *

[p. 441] Q Well, why don't we start with ten PSI. Was this tire run low at ten PSI for more than a mile?

MR. JACKSON: Object to the form.

BY MR. BABINGTON:

[p. 442] Q Is there any evidence of that?

A I can't determine that. There is no significant damage, so whatever the tire's resistance to running that way, it was under that.

Q Is there any damage at all to this tire from being run low?

A No.

Q Several times you've referred to the quality of the tire as being one of the things that would determine how long something might take to occur or in order to qualify one of the answers you gave. On a scale of one to ten, what is your opinion of the quality of this tire?

A I haven't determined that yet.

Q Do you have an opinion about that as we sit here today?

MR. JACKSON: Let me object to the form. Can you put a time frame on it? I mean what does he think about the quality of the tire now? Or when it left the manufacturer? Or in general? It's really not a fair question.

BY MR. BABINGTON:

Q Does the quality of a tire change?

[p. 443] A Oh, it can.

Q Once it's manufactured, what you're saying is the quality of the tire can change?

A Well, depending on what you call quality. What I'm referring to is resistance to certain conditions.

Q What would cause the quality of a particular tire to change after it's manufactured?

A Well, some tires just fall apart after a certain period of time.

Q So the quality of the tire might be great up to a certain period of time and then very poor after that period of time; is that what you're saying?

A It could.

Q Is that true with this tire?

A I don't know.

Q Do you have any opinion of the quality of this tire on a scale of one to ten at any point in time?

A No.

Q What additional information would you need to reach that opinion?

A Adjustment rates, test results.

Q Anything else?

[p. 444] A There could be a lot of things. Complete specifications.

Q Anything else?

A That would be a good start.

Q Why would you want that information to determine the quality of the tire?

A I didn't say I wanted it.

Q That's what you said you would need in order to determine what the quality of the tire was; is that correct?

A If I wanted to.

Q Do you feel what the quality of this tire is is important to any of your analyses?

A Well, it could be. See, there's two types of problems: there's random error and there's systematic error. You know, you have an error in this tire and I don't know whether it's random or systematic. I don't care at this point.

If I'm asked to determine whether y'all have a design problem, which is more or less a systematic error, or just a production problem, which is generally a random error, then I'll ask for those things.

Q Do you know whether this tire had a design or [p. 445] a manufacturing defect?

A For about the tenth time, no.

Q Was this tire ever run flat, in your opinion?

A No.

Q Is there any sidewall run-flat damage on this tire?

A No.

Q Is there any discoloration to the sidewalls?

A There is a lot of mud on it.

Q Well, I'm talking about discoloration in the rubber due to heat or some other factor.

A Not in the sidewall.

Q And when I say the sidewalls, I'm talking about both sidewalls. You understood that, right?

A Yes.

Q Is there anything else that you find significant about the sidewalls on this tire?

A There are no significant signs of any impact in the sidewall. No signs of significant impact.

Q Anything else?

A That's all.

Q I would like for you to take a look at the tire with me for a second. Looking at the black side [p. 446] of the wall here, see these pits and abrasions that you see on the sidewall?

A Yes.

Q What caused that?

A Contact during the accident. There's not much.

Q Is that run-flat damage?

A No.

Q What is that? How would you describe that?

A It's just wearing of the sidewall, abrasion.

Q So there is abrasion on the sidewall there; is that correct?

A There's some abrasion, yes.

Q Do you have an opinion about what caused that abrasion? For example, let's look at a specific spot. If we look right under this 9-15-94 that's written in white on the tire, right where it says Standard Road, there's abrasion there. Do you have an opinion about what caused that?

A That is not very significant.

Q That's not my question whether it was very significant. Do you have an opinion about what caused it?

[p. 447] A No, I don't. It could have hit something in the body part. It could have been the wheel.

Q You think that happened during the accident?

A Yes.

Q You don't think this mark and the other similar marks on this sidewall occurred before the accident?

A Well, there were some that looked like it might have scrubbed the curb a little bit.

Q Are these sidewall marks, in your opinion, consistent with the tire being run low?

A No, they aren't.

Q Are they consistent with the tire being run flat?

A No, they're not.

Q What would sidewall damage from a run-low condition look like?

A You can see a constant circumferential discoloration.

Q And what you're talking about there is damage that is continuous around the whole tire?

A Yes. You can also see pavement marks in the upper sidewall, which you don't see anything like that [p. 448] here.

Q Well, with all due respect, as I rub my hand around this sidewall I feel what I consider to be a fairly continuous abrasion at that level of the tire. I mean it's deeper in some areas than it is in others, but it seems to be fairly continuous.

You don't see that or feel that when you rub your hand on there?

A It's not anything like the rim flange.

Q Let's look at the other sidewall, the white sidewall on this tire.

A Yes.

Q Is there any deterioration on this sidewall?

A There's general aging and dirt, of course, but there's no run-flat damage.

Q Is there any run-low damage?

A No.

Q Is there anything else significant about this sidewall that you see in looking at it?

A Well, the inner liner is in very good shape. Many times you'll see the discoloration in the inner liner before you will on the outside.

Q Let's look at the bead area. That's the last [p. 449] area you said you would look at?

A Yes.

Q We talked about this a little bit before and I'm trying not to be repetitive but to just talk intelligently we have to set the stage.

As I understand what you said earlier in your deposition, the last time we got together, is that there was a bead groove, as you called it, on the whitewall side of the tire; is that correct?

A There is some evidence of a groove there.

Q Where is that, can you point it out to me?

A It's in here. It may be mostly molding, but there is a little bit of a defamation there and you can see the carcass plies in some places.

* * *

[p. 450] Q Do you have any opinion as to whether or not this bead groove, as you call it, to the extent where it even reveals the carcass ply, was caused before the accident?

A Well, I think it got thin before the accident. It may be that the rubber was too thin. But I think most of it was done during the accident.

Q If it was caused before the accident, that would be consistent with overdeflection, would it not?

A No, it was probably a thin rubber there. Normal running can cause that if you don't make that rubber there thick enough.

[p. 451] Q How do you know it's caused by overdeflection as opposed to thin rubber? How can you make that determination?

A Well, there's nothing on the other side.

Q I thought earlier you said that the bead groove on the whitewall side was caused by damage during the accident.

A That's correct.

Q And that explains why there is a bead groove on the whitewall side of this tire and what, in your opinion, is little or no bead groove damage on the black-wall side?

A Yes.

Q Is that still your opinion?

A Yes.

Q Well, it sounds like you've reached a new opinion, which is that the explanation for that is that there was not enough rubber put on the tire on the whitewall side bead area as opposed to the black-wall side?

A I think some of this was done before the accident and that was because of the lack of rubber there. But most of it was done during the accident [p. 452] scenario.

Q Can you give me a percentage of what occurred during the accident and what occurred before?

A No.

Q But most occurred during the accident, just some of it, a little percentage, occurred before?

A Yes.

Q That's a, you know, with all due respect, that's a change in your testimony from the last time we deposed you when you said this was all due to damage during the accident.

A Well, I think most of it was done in the rubber there. There's not that much real damage there, you know, as far as erosion.

Q If you look at the rim of the wheel, the rim flange of the wheel, you can actually see where the carcass ply has made a mark on this rim flange, hasn't it?

A Yes.

Q And that matches up with the bead groove on the whitewall side; does it not?

A That's right.

Q I understood you to say earlier in your [p. 453] deposition, the last time we were together, that those marks on the rim flange were caused during the accident.

A I think most of them were.

Q These were not caused before the accident as a result of the tire being run flat or run low?

A Well, when I've seen this before, I've seen it caused by exposed cords through here that happen over a long period of time.

Q And that's what you have, don't you, you have exposed cords in the whitewall bead area?

A Yes.

Q And those have left marks on the rim flange?

A Right.

Q And isn't that consistent with an indication of overdeflection of this tire?

A Not at all. If you had overdeflection you would have both beads seated and you would see something on the other sidewall.

Q Well, isn't it true that there are always variations between the bead grooving of a tire?

A There are.

Q And that's due to lots of different factors?

[p. 454] A Could be.

Q For example, roads typically are sloped where you have a crown in the middle of the road; isn't that correct?

A Well, if you look at an axle that's a solid axle, you would expect the bigger bead grove to be on the one that has the least bead grooving.

Q Wait, that didn't make any sense to me.

A Okay. You have a solid axle rear suspension. If you're saying the tire is run overdeflected, then the outside sidewall is going to be deflected more than the inside, which is opposite to what you have on this tire.

Q That assumes that the suspension is completely okay with this vehicle; is that correct?

A Well, it's a straight axle.

[p. 455] Q So your two explanations for the reason why the white sidewall in your opinion has greater bead grooving is: One, it occurred during the accident and, two, to the extent it occurred before the accident it was due to there being a thin rubber application in that area?

A That's right.

Q Let's look at the black sidewall groove.

A Yes, sir.

Q Is there a bead groove on the black sidewall?

A There's not much of one at all. There's an intermittent one at some places.

* * *

[p. 456] Q So in your opinion there's no bead groove or very insignificant bead groove on the black sidewall?

A It's insignificant.

Q You're not saying that the thin rubber on the whitewall side bead had anything to do with the tire failure?

A No.

Q You're just saying that's an explanation for the rim flange impressions that we see?

A That's correct.

Q You agree that the rim flange impressions that we see on this rim can only occur over a long period of time; is that correct?

A On the rim or on the tire?

Q On the rim.

A On the rim?

Q Yes.

A I think it can occur during the accident scenario. This tire appeared to go a long distance of rolling during the accident.

Q How long?

A It could have been a hundred and fifty feet, I [p. 457] don't know. I haven't looked at the accident report.

Q And you think that's sufficient to leave those types of impressions?

A I think it's probable. I think part of it was done beforehand. I don't know how much.

* * *

[p. 458] Q When did you reach this opinion about the rubber being thin on the beads?

A I recalled the experience I had after the last deposition.

Q So that was something that you reached after our last deposition?

A That's correct.

Q Did you look at the tire again today?

A Yeah.

Q How long did you spend looking at the tire today?

A I don't know.

Q Did you come in from Kentucky this morning or last night?

A This morning.

Q What time did you arrive at Mr. Jackson's office?

[p. 459] A Ten o'clock, I guess.

Q And we started this deposition at one, so you would have spent, you know, less than three hours; is that correct?

A That's correct.

* * *

[p. 462] Q The task is to determine what caused the separation. You see things and say the cause is lack of adhesion but there is evidence there, will you not admit, that is consistent with there being overdeflection of this tire?

A No, there isn't.

Q You just don't agree with that?

A No.

Q You don't think there's any evidence on this tire that it was ever overdeflected?

A I think one sidewall was overdeflected when the tire was flat.

Q Other than that, none?

A That's correct.

Q No evidence?

A That's correct.

Q And the only time the tire was flat was during the accident?

A After the separation.

Q How many punctures are there in this tire, do [p. 463] you know?

A I believe there's one puncture.

Q And that was the one that we talked about last time where they had the chemical patch applied on the inner liner?

A Yes.

Q Do you know if there are any other punctures?

A I didn't notice any.

Q Assume for me that there's a puncture in the belt edge area that doesn't go all the way through the inner liner.

A Uh-huh.

Q What significance would that be to you?

A You could form a separation if you had corrosion in there.

* * *

Q A separation caused by a puncture in the belt edge area that does not compromise the inner liner but [p. 464] allows foreign material and dirt and air and water to get in there would be a separation that was a result of some abuse factor and not a separation that was the result of a design or manufacturing defect?

A That's correct. And in the last deposition I told you I had sent a tire back that had that particular condition. It's easy to spot.

Q How do you spot it?

A Well, you find a smoothing around the – a polishing around the area and corrosion.

* * *

Q Now in the last deposition you mentioned that you were basing some of your opinions on knowledge that you had gleaned from articles on tread wear.

A Yes.

Q And we discussed that you would locate those articles and I would pay you for that. Have you done that?

A No, I haven't.

Q Didn't do that, okay.

A I've been waiting for a copy of this thing but haven't got one yet.

Q Have you remembered what those articles are, so I might look them up myself?

A They are SAE articles.

Q Do you recall when they were published, approximately?

A In the last 12 years, I believe, or 15 years.

Q And they were published in what location or in [p. 466] what magazine?

A They are papers available from the SAE.

Q Do they have a magazine or would these be papers that would have been published at one of their meetings?

A They would have been noticed, either at a meeting or in the magazine, and you can order them from SAE.

Q Do you recall the general title of the articles?

A No, I don't recall the title. One of them was an exhaustive study of tread wear factors, comparing bias and radial. I believe it was done by Uniroyal.

* * *

[p. 472] Q Do you agree that the overdeflection damage from the puncture site wouldn't be localized to the puncture site in this tire? The one puncture in this tire that you recognize exists there, assuming that caused overdeflection damage because the tire ran low or ran flat, that damage wouldn't be localized just to [p. 473] the puncture site; you agree with that?

A Well, it could grow from that point.

Q But it wouldn't be localized to that, it would exist elsewhere as well?

A There could be polish otherwise. There probably would be. But there would have to be polish around the puncture.

Q Do you agree that where overdeflection is caused or results from puncture of a tire, it's not the hole itself that causes the damage but it's the loss of air pressure that comes from, you know, having a puncture that hasn't been repaired or that still leaks?

A Yes.

Q And the damage, again, results from the tire being overdeflected, and heat building up, which puts a severe stress on the structure of the tire when heat builds up like that?

A Yes.

* * *

[p. 474] Q Do you know what the error rate is for your method of tire failure analysis?

A No.

Q You do agree that it depends in large part on interpretation of a subjective nature of what you see in a tire after failure?

A The experience and knowledge are all factors. There is some subjectivity, as there is in every human endeavor: your expert, our expert, whatever, your business, my business.

[p. 475] Q And you can't quantify for me that subjectivity; is that correct?

A I can't put a number on it.

* * *

Q Do you have any opinions other than what's stated in Defendants' Exhibit 2?

A As we talked about before, I think that the sidewall may have had a thin rubber layer on one sidewall.

Q Other than that opinion, anything else?

A No.

* * *

[p. 477] Q Okay. Your Exhibit 2 – do you have a copy of this? Does he have a copy so I can read off this one?

Exhibit 2 states that the accident tire, right rear on Aerostar van, was received in a laboratory and examined June 1, 1993. Did I read that correctly?

A Yes.

Q That's a mistake, isn't it, in the report? This accident didn't occur until July 6, 1993.

A It's probably '94.

Q Who was present when that was received?

A I don't know.

[p. 478] Q You weren't there?

A No.

Q And do you know what type of examination was done?

A Well, I can guess.

MR. JACKSON: Don't guess.

BY MR. BABINGTON:

Q Then it says, going on, in the next sentence it says that the tire was manufactured during the sixth week of 1978.

That's a mistake, too, isn't it?

A Yes.

Q It wasn't made in the sixth week of 1978 but the sixth week of 1988; isn't that correct?

A Yes.

* * *

[p. 483] Q Do you know why this tire had a lack of adhesion? You've said in your opinion there was a lack of adhesion. Do you know specifically why or what that lack of adhesion was caused by?

A No.

Q So other than stating your general theory that this tire failed because of a lack of adhesion, you can't be more specific?

A No.

Q I think we talked about this a little bit earlier but I just want to be clear on it. Are you saying that this tire was defectively designed in any respect?

A I don't know.

[p. 484] Q Your report says the tire failed as a result of a manufacturing defect in the form of insufficient adhesion. Did I read that correctly?

A Yes.

Q And you don't say anything in your report about there being a design defect.

A That may be another mistake.

Q And as I understand, your position on that is you do not know if there was a design defect at this point; is that correct?

A I could not determine whether it was manufacturing or design.

Q So even though you say in your report you believe it was a manufacturing defect, what you're saying now is you don't know whether it was a manufacturing defect or a design defect.

A I think I tried to correct that language last time.

Q But that's your position is that it's either one or the other, you're not sure which?

A Same thing.

Q Well –?

A At this point. As I said before, I can't [p. 485] determine the difference right now.

Q What further work would you have to do to determine the difference?

A Well, let me visit the factory, let me look at the design specs, let me look at all the material specs, let me look at the testing used for development, and let me look at the adjustment rates.

Q Anything else you would need to make a more specific determination of whether it was design or manufacturing defect?

A I think I could do it from that.

Q Based on what you know now do you have any criticism of the design?

A No.

Q You stated that, in your report, you believe the tread and belt separation initiated at the steel belt edges; is that correct?

A Yes.

Q What evidence do you base that on?

A The edge of the belts are shiny.

Q Anything else?

A There's polish in the area in the rubber that still exists.

[p. 486] Q Can you pinpoint the exact location where the separation began?

A Not today, I think I know where it is but – it should be under the flat spot.

Q Under the flat spot.

A Under the bare spot. Or what are we calling it? The worn spot, the bald spot.

Q Just so it's clear on the record, you believe the belt edge separation began underneath the part of the tread that is most worn and that has zero remaining tread depth; is that correct?

A That's the most likely spot.

* * *

Q Can you, looking at the tire for me, tell me where you think the separation started? I want to pin that down as close as we can.

* * *

[p. 488] THE WITNESS: I believe the most likely place is under this bare spot which is marked on the tread by P-810 match point and on the tire by P-810, also. You see traces of the crescent-shape initiation of the separation.

BY MR. BABINGTON:

Q When you say "match point," that's abbreviated MP?

A Yes. You can see here some type of crescent, although this one is somewhat even across the period of time – I mean the circumference of the tread.

But there's one other place which is possible, which is in this area also, which is near the – this spaghetti-like appearance.

MR. BABINGTON: Sid, with your permission, I'm going to put a little Plaintiff's No. 1 on the second spot he identified, because I think it's just unclear on the record if we don't.

MR. JACKSON: All right, that's fine.

* * *

[p. 489] Q Do you have any opinion about whether or not there is a hole in the belt edge at that location, P-810-MP?

A I don't think there's one. There's a small hole in the rubber but I don't think it goes very far.

Q When you talk about the small hole in the rubber, you're talking about right at the underside of P-810-MP where those wires are sticking out?

A I think it's farther out than that. There's a hole here and a hole there. I don't know if that's a hole yet. That's really more into the cap ply area.

[p. 490] Q You do agree that there are some holes on the exterior of the tread there, you just don't know how far they go through?

A There always are.

Q Well, is that yes or no?

A There are things that appear to be a hole.

* * *

[p. 494] Q Did this tire suffer an explosion or massive decompression, I think as you termed it earlier?

A I believe so, yes.

Q And you said that would sort of cloud things a [p. 495] little bit, make it more difficult to see things; is that right?

A Well, it can in some cases. This one is pretty clear-cut, I think. For instance, like this is probably due to the depression, the baring of the wires, but not all of it is due

to the explosion. There has to be some rubbing before it to, you know, get a wire that clean.

But some of it like – like this where you have the spaghetti, you know, they are – when it's blown apart like this wire in here, you know, this is pretty clean, and yet it wasn't around an area of a great polish.

Q You don't believe that the markings on the tire were improper?

A I don't.

Q Mr. Edwards had expressed that earlier but you disagree with him on that?

A I do.

* * *

[p. 502] Q Why don't you tell me what you understand to be the sequence of events in the accident.

A The right rear tire separated. That would induce a steering input to the vehicle. The driver probably then corrected that and turned over to the right.

Q What do you base your statement of that sequence on?

A Well, this is right rear tire – what I'm saying essentially is an accident can occur with a separation of this type.

Q What do you base that statement on, the sequence that you gave me?

A It's a very common scenario that happens in these cases with rear wheel separations.

* * *

[p. 506] Q How do you explain that the vehicle moved to the left during the accident sequence if the force as a result of the tire blow-out would have caused it to pull to the right?

A That appears to have been what happened from the, you know, photographs and from looking at the [p. 507] wheels and the tires.

Q Do you have an explanation for why that happened?

A Why what happened?

Q Why the vehicle went left as opposed to right after the tire failed.

A Well, there was a steering input induced by the car, and it was corrected by the driver. And when he did so – when a car is being steered to the left, it depends on the right rear tire to maintain control. And there was no tire there. There was no undamaged tire there. And so the vehicle could lose control.

Q What you're saying is that Mr. Carmichael turned the wheel to the left and that's why the vehicle went left?

A He reached to a vehicular steering input and then he turned the wheel to the left. And the car wasn't the car he was used to, because it has a blown tire, and the rim flange is bent over, so it was on the – on the pavement at that time. And that's probably what caused his loss of control.

Q Do you have an opinion about what Mr. Carmichael should have done during the accident [p. 508] sequence after the tire failed?

MR. JACKSON: Object to the form.

THE WITNESS: What a tense driver can do can be miraculous. And there are ways to control that. Some of them can't be controlled, it depends on the vehicle. And I haven't done a study of the vehicle.

BY MR. BABINGTON:

Q So it could be that the reason that this van flipped and overturned was because of the vehicle characteristics?

A It's possible.

Q And that could be the reason why the vehicle went out of control was due to the vehicle characteristics; is that correct?

A No, because the tire failed.

* * *

[p. 509] Q Just so we're clear on this, the reason the vehicle went left was because Mr. Carmichael steered it to the left?

A He was responding to a vehicular steering input to the right.

Q But he did steer it to the left?

A Yes, trying to react to it.

Q Do you know the degree of steering input?

A No, it would depend on the vehicle characteristics.

Q Do you think that he oversteered to the left?

MR. JACKSON: Object to the form.

THE WITNESS: He wouldn't have to.

BY MR. BABINGTON:

Q Why not?

A Well, because he doesn't have a tire on the [p. 510] back that would maintain control.

* * *

[p. 511] Q Let me back up a second. You've already, Mr. Carlson, you've already given me your description of what you consider to be the classic, so-called classic pattern where a right rear tire blows out; is that correct?

A Yes.

Q And you said you based that on your personal experience of having two flat tires yourself on your right rear and on reading depositions; is that right?

A Reading depositions and the engineering analysis.

Q And the engineering analysis consists of what? That's what I'm trying to find out. What did you do?

A Oh, trying to explain what has been happening [p. 512] to vehicles with rear tire blowouts.

Q Well, what specifically have you done or have you read about that constitutes engineering analysis

where you have a right rear tire that goes out on this type of vehicle?

A Oh, well, it's just thinking through what has happened and why these things happen.

Q What you're saying is you're just applying your general knowledge, because you're an engineer, as if you put drag on the right rear what will happen to the vehicle?

A Yes. And the fact that I've done handling tests. And, then, it's not a unique scenario.

Q Is there any literature that you're aware of that's been published that deals with this so-called classic pattern?

A I'm not sure it's been written up, but I know it's been used over and over again in certain types of vehicle failures, tire failures.

* * *

[p. 516] Q Do you have any other opinion about the accident sequence that we haven't covered?

A In a nutshell, it's just that a separation like this can cause lost control of a vehicle.

* * *

[p. 521] Q Now you mentioned this new opinion about the thin rubber on the bead. Did you talk with anyone about that?

A No.

Q Did you consult with George Edwards about that?

A No.

Q Did you review any literature in connection with that new opinion?

A No.

Q There's nothing new that you looked at and no new evidence that you considered in order to reach that opinion about the thin rubber on the bead?

A No.

• • •

[p. 522] I, Marie Garofalo, do hereby certify that the above and foregoing transcript of proceedings in the matter aforementioned was taken down by me in machine shorthand, and the questions and answers thereto were reduced to writing under my personal supervision, and that the foregoing represents a true and correct transcript of the proceedings given by said witness upon said hearing.

I further certify that I am neither of counsel nor of kin to the parties to the action, nor am I in anywise interested in the result of said cause.

• • •

Defendant's Exhibit 2 to Carlson deposition in Carmichael

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

PATRICK CARMICHAEL, et al.,	•	
Plaintiff,	•	
vs.	•	CIVIL ACTION:
SAMYANG TIRE, INC., et al.,	•	93-0860-CB-S
Defendants.	•	

PLAINTIFF'S SUPPLEMENTAL RESPONSES TO DEFENDANT KUMHO USA's FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION

Come now the Plaintiffs, by and through their undersigned counsel, and file this their supplemental responses to Defendant Kumho USA's first set of interrogatories and requests for production in conjunction with this Court's Order dated September 7, 1994.

Interrogatory 19. State the name and address of each person you expect to call as an expert witness at the trial of this matter, and further state the subject matter on which each such expert is expected to testify, the substance of the facts and opinions to which each such expert is expected to testify, and the grounds, facts, materials, and documents on which each such expert has relied in forming his opinions or on which any such opinion to be offered at trial is based.

RESPONSE

Dennis P. Carlson, Jr.
The Edwards Building
4000 Shelbyville Road
Louisville, Kentucky 40207
See attached CV

Interrogatory 20. Please state whether you or anyone acting on your behalf, including but not limited to any of your experts who you expect to testify at trial, has made, performed, or conducted any tests, procedures, or evaluations, or otherwise obtained any results or data regarding any allegedly defective product or component which was attached to or affixed to the van at the time of the accident, and if so, describe in detail the nature and purpose of each such test, procedure, or evaluation, identify all persons having knowledge or information regarding same, and state and explain the conclusions, results or data thereby made or obtained.

RESPONSE

The accident tire (right rear on Aerostar Van) was received in the laboratory and examined on July 1, 1993. This tire is identified as a Hercules Superior XII, size 205/75R14 and having DOT Serial Number H2ADYPU068 indicating it was manufactured by the Samyang Tire, Inc. Kwangsangun, Chonnam, Korea during the 6th week of 1978. "Made in Korea" was molded into the sidewall.

The tread and outer steel belt had separated and completely detached from the tire cord body. Three of these tread and belt fragments were found at the scene of

the accident and accompanied the tire. During its service life this tire was penetrated by an object such as a nail. The tire was removed from the rim and a chemical cure patch was satisfactorily applied to the inner-liner.

The rim flange impressions at the upper heel of the bead were normal, indicating the tire had not been operated overloaded or underinflated, The tread depth remaining was 3/32". Circumferential nylon plies were placed over both steel belt edges, but were not identified on the tire sidewall.

The tread and belt separation initiated at the steel belt edges. The laminated surfaces showed evidence of insufficient adhesion between various interfaces. Chafe and polish was evident, indicating the separation preexisted the tire failure over a prolonged period of time. The tire failed as the result of a manufacturing defect in the form of insufficient adhesion.

JACKSON, TAYLOR &
MARTINO, P.C.
Attorneys for the Plaintiff,

BY: /s/ SIDNEY W. JACKSON, III

BY: /s/ STEVEN A. MARTINO

[Certificate Of Service Omitted In Printing]

Defendant's Exhibit 3
to Carlson deposition
in Carmichael

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

George R. Edwards
TIRE CONSULTANT
THE EDWARDS BUILDING
4000 SHELBYVILLE ROAD
LOUISVILLE, KENTUCKY 40207

502/893-3686
FAX 502/896-6289

September 14, 1994

Sid Jackson, Esquire
Jackson, Taylor & Martino
Southtrust Bank Building
61 St. Joseph Street, Suite 1500
Mobile, Alabama 36602

Re: Hercules Korean Tire Failure, Carmichael Case, My Tire Code P-810

Dear Mr. Jackson:

During the last week in June 1993, I was contacted by you office concerning the Carmichael accident. The accident tire (right rear on Aerostar Van) was received in my laboratory and examined on July 1, 1993.

This tire is identified as a Hercules Superior XII, size 205/75R14 and having DOT Serial Number H2ADYPU068 indicating it was manufactured by the

Samyang Tire, Inc., Kwangsan-gun, Chonnam, Korea during the 6th week of 1978. "Made in Korea" was molded into sidewall.

The tread and outer steel belt had separated and completely detached from the tire cord body. Three of these tread and belt fragments were found at the scene of accident and accompanied the tire. During its service life this tire was penetrated by an object such as a nail. The tire was removed from the rim and a chemical cure patch was satisfactorily applied to the inner-liner.

The rim flange impressions at the upper heel of the bead were normal, indicating the tire had not been operated overloaded or underinflated. The tread depth remaining was 3/32".

Circumferential nylon plys were placed over both steel belt edges, but were not identified on the tire sidewall.

OPINION

The tread and belt separation initiated at the steel belt edges. The laminated surfaces showed evidence of insufficient adhesion between various interfaces. Chafe and polish was evident, indicating the separation preexisted the tire failure over a prolonged period of time.

The tire failed as the result of a manufacturing defect in the form of insufficient adhesion.

Sincerely,

/s/ George R. Edwards

GRE/bb

**Defendant's Exhibit 6
to Carlson deposition
in Carmichael**

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

JACKSON, TAYLOR & MARTINO, P.C.
LAWYERS

January 25, 1995

Mr. Dennis Carlson
Edwards Building
4000 Shelbyville Road
Louisville, Kentucky 40207

Re: Carmichael v. Kumho, et al

Dear Dennis:

This will confirm my meeting you at the Louisville, Kentucky airport at 11:05 a.m. on February 7, 1995.

I have again spoken with defense counsel and they now want to take your deposition March 7, 1995 here in Mobile. Please check your availability and let me know as soon as possible so we can confirm that date. This is contingent upon us agreeing that you will go forward on plaintiff's behalf in giving expert testimony.

Sincerely yours,

SIDNEY W. JACKSON, III
For the Firm

SWJ/jd

**Defendant's Exhibit 6
to Carlson deposition
in Carmichael**

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

George R. Edwards
TIRE CONSULTANT
THE EDWARDS BUILDING
4000 SHELBYVILLE ROAD
LOUISVILLE, KENTUCKY 40207

502/893-3686
FAX 502/896-6289

March 1, 1995

Sid Jackson, Esquire
Jackson, Taylor & Martino
Southtrust Bank Building
61 St. Joseph Street, Suite 1500
Mobile, Alabama 36602

Re: Hercules Korean Tire Failure, Carmichael Case, My Tire Code: P-810

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The tread and outer steel belt had separated and completely detached from the tire cord body. Three of these tread and belt fragments were found at the scene of the accident and accompanied the tire. During its service life this tire was penetrated by an object such as a nail. The tire was removed form the rim and a chemical cure patch was satisfactorily applied to the inner-liner.

The rim flange impressions at the upper heel of the bead were normal, indicating the tire had not been operated overloaded or underinflated. The tread depth remaining was 3/32".

Circumferential nylon plies were placed over both steel belt edges, but were not identified on the tire sidewall.

OPINION

The tread and belt separation initiated at the steel belt edges. The laminated surfaces showed evidence of insufficient adhesion between various interfaces. Chafe and polish was evident, indicating the separation preexisted the tire failure over a prolonged period of time.

The tire failed as the result of a manufacturing defect in the form of insufficient adhesion.

Sincerely,

George R. Edwards
Dennis P. Carlson, Jr.

DC/bb

Defendant's Exhibit 6 to Deposition

George R. Edwards
TIRE CONSULTANT

The Edwards Building
4000 Shelbyville Rd.
Louisville, Kentucky 40207
502 893 3685

FEE SCHEDULE
Effective January 1, 1993

HOURLY RATE	$195
TRAVEL TIME	90
EXPERT TESTIMONY DEPOSITION or TRIAL APPEARANCE (4 hour minimum)	245

Tire examination including verbal report:

Passenger & LT	750
Truck (20" & up)	1,000
Photography to document evidence	150

A non-refundable retainer in the amount of $2,500 is required if Edwards is to be named as an Expert Witness.

Expertise that comes from years of experience

[Picture Omitted In Printing]

- FORMER PRESIDENT OF RADIAL TIRE MANUFACTURING CORPORATION.
- AWARDED U.S. PATENT FOR METHOD MANUFACTURE OF STEEL RADIAL TIRES CURRENTLY LICENSED TO GOODYEAR.
- FORMER PRESIDENT OF DOT APPROVED TIRE TESTING LABORATORY.
- AUTHOR OF HUNDREDS OF PUBLISHED TIRE TECHNICAL ARTICLES.
- TIRE CONSULTANT CONTRACTS:

  Goodyear Tire & Rubber Company
  Brigestone Tire Research
  Owens Corning Fiberglas Corp.
  National Standard Company
  Phillips Petroleum Rubber Division

- AIR FORCE VETERAN WITH MULTIENGINE AND INSTRUMENT RATINGS.
- YEARS OF TECHNICAL, RESEARCH AND DEVELOPMENT WITH TWO TIRE MANUFACTURERS.

Trial Lawyers
Write Edwards

Firestone

"I want to express my appreciation for your tremendous expertise in not only developing this case, but in presenting it to a jury. Our $3,189,000 verdict would not have been possible without your assistance."

PAT MALONEY, JR.
Law Offices of Pat Maloney
San Antonio, Texas

Kelly Springfield

"As you know, the jury returned a verdict for $178,000.00. No one was more surprised than I was. You did a tremendous job and we certainly appreciate your fine work."

ROBERT J. DONOVAN
Daggett, Van Dower, Donovan & Cohoon
Mariana, Arkansas

Michelin

"The jurors indicated that it took about 5 minutes to arrive at a unanimous verdict of $871,000.00. Your abilities and professionalism set a standard that we will not often see repeated by other witnesses."

JOHN WOODDELL,
Strong, Plucek & Wooddell
Springfield, Missouri

Armstrong

"In settlement of this case, Armstrong will pay $2,500,000 cash. The work you did for us on this case was the most significant factor in our obtaining such a favorable settlement."

P. JAY WILKER
Ford Marria Esposito & Witneyer
New York City

Goodyear

"I am in receipt of your report in the Rogers vs. Goodyear file. I have shown it to other lawyers in the office so they can see a standard by which all other reports can be measured. This is the finest quality work that I have seen."

DAVID H. FINK
Fink, Owen, Travis & Dean
Atlanta, Georgia

Uniroyal

"So, once again, you've been in a case with high damages. You were extremely helpful and we are very pleased with the excellent job you did."

DAVID A. THOMSON
Milner and Pitt
Tucson, Arizona

Goodyear of Canada

"The trial in which you testified was successful. ($2,000,000.00 jury verdict) It was an honor and a privilege to work with you."

MEREDITH L. LAWRENCE
Attorney at Law
Cincinnati, Ohio

Michelin

"You focused on the cause of this case from the very beginning and your work both before and during trial was the best I have ever experienced."

MEREDITH L. LAWRENCE
Attorney at Law
Covington, Kentucky

Goodyear

"I am pleased to report that we have settled our case with Goodyear for the sum of $575,000. This is easily the largest settlement ever in a case of this type in our area. A substantial portion of the credit should go to you for the invaluable assistance you gave us in preparing our case and testifying in behalf of our client."

BEN F. EASTERLIN, IV
Ellis, Easterlin & Pengler
Americas, Georgia

Firestone

"The actual damages found by the Jury was in the amount of $450,000. Combining this figure with the punitive damages of $100,000 their total finding was $540,000. It was a pleasure working with you and I hope to have the honor to do so again in the future."

ROBERT E. JOHNSON, JR.
Murphrey, O'Quinn & Cannon
Houston, Texas

Armstrong

"As you are aware, we settled our case with Armstrong in the amount of $90,000. This is to thank you for your diligence and detective work in ascertaining the nature of the defect which caused the tire failure. Without your help, it is questionable whether we would have obtained the favorable settlement."

TOD SCHLEIER
Sternberg, Sternberg, Rshim & Schleier
Phoenix, Arizona

General

"We have settled the case with General, rest assured that if I require the services of a tire expert in the future, I will certainly contact you."

JACK CAREY
Carr, Korein, Kunin, Schlichter & Brennan
East St. Louis, Illinois

Firestone

"I am pleased to report we have settled with Firestone for a very satisfactory figure. I can assure you that there would have been no settlement had it not have been for your testimony, your analysis of the tire, Firestone's recognition of your expertise and the assistance you provided in taking of the Firestone's experts depositions."

DALE HARALSON
Haralson, Kimerk & Morey
Tucson, Arizona

Firestone

"Shortly after taking your deposition we reached a settlement with Firestone which was agreeable with our client. If we ever have need again for a tire expert we will not hesitate to call you."

JERRY E. MASSANTI
Drew & Massanti
Lake Village, Arkansas

Modern Trials

"Thank you so much for your article on Tire failure analysis. This is exactly what we want, and we have it . . . with appropriate credit of course . . . to our new MODERN TRIALS."

MELVIN M. BELLI
Belli & Chonalis
San Francisco, California

[p. 1] IN THE UNITED STATES DISTRICT COURT FOR
THE MIDDLE DISTRICT OF ALABAMA
NORTHERN DIVISION

CIVIL ACTION NUMBER
94-T-997-N

PHYLLIS A. TILLERY,

Plaintiff,

vs.

BRIDGESTONE/FIRESTONE, INC., et al.,

Defendants.

DEPOSITION TESTIMONY OF:
DENNIS P. CARLSON

March 23, 1995
10:00 a.m.

COURT REPORTER:
DAVID L. MILLER, CSR, RPR, RMR

* * *

[p. 3] INDEX

* * *

[p. 7] MR. BABINGTON: That's fine.

EXAMINATION BY MR. BABINGTON:

Q. Would you state your full name, please.

A. Dennis P. Carlson, Jr.

Q. What is your date of birth?

A. 10/26/47.

Q. Your residence address?

A. 2537 Carolina Avenue, Louisville, Kentucky.

Q. Residence phone?

A. 456-9645.

Q. What is your business address?

A. 4000 Shelbyville Road, Louisville, Kentucky.

Q. Your business phone?

A. 893-3686.

Q. As I understand it, you currently work for George Edwards, Inc.

A. That's correct.

[p. 8] Q. And you still continue to do some contract work for your former employer, SEA?

A. Yes.

Q. Both of those companies, George Edwards, Inc. and SEA, are in the business of litigation consulting?

A. Yes.

Q. That hundred percent of the work that you do right now involves either cases that are being evaluated for a lawsuit or litigation, or matters that are in litigation; is that correct?

A. Almost a hundred percent.

Q. What percentage is not litigation related?

A. Well, there are tires that I'm not sure that I have looked at that I'm not sure what the purpose of – the

purpose for looking at them. There are certain tires that we get occasionally that people just want to know what happened to them, like a trucking company [p. 9] or something like that. And I just have to leave that door open. Some of those things come in from time to time.

Q. Okay. Other than those few items that you just mentioned, all of your work involves litigation; is that correct?

A. Everything has the potential to be litigation.

Q. And you don't have any other work that you do for pay at this time, other than what you do for George Edwards or SEA, the few remaining contract items there that you are finishing up?

A. That's correct.

Q. All right. I think you said previously that the work that do you for George Edwards with respect to tire failure analysis is a hundred percent for the Plaintiff; is that correct?

A. He has some defense work, so I can't speak for him. But all of the work that I have done, that I know of, is [p. 10] Plaintiff work.

Q. Now, you hold yourself out as an expert in the area of tire failure analysis; is that correct?

A. Yes.

Q. Can you define for me what you consider to be encompassed by tire failure analysis.

A. How a tire fails.

Q. And what does a tire failure analysis expert do to determine that?

A. He looks at the available evidence to see what – how a tire fails.

Q. What evidence would be important to a tire failure expert in making that determination?

A. Well, generally, you can find the majority of the information in the tire itself. There are many situations where you try to narrow it down where you need more information as to the process design, information from other tires, exemplars.

[p. 11] In some cases it is very important to find out how the accident occurred, the conditions of the use of the tire.

Q. Anything else that would be relevant to someone doing tire failure analysis?

A. Well, in many cases, the mounting – or the total history of the tire up to the accident. Sometimes you have to know the history of the tire after the accident. That can be important in many cases.

Q. Anything else?

A. Well, I do look at factory equipment techniques, adjustment records, testing by other companies. I look at those and evaluate that.

Q. Is there anything else that you haven't mentioned that you would look at or want to look at if it were available?

A. There are many cases where we [p. 12] have to go into the factory to determine – look at the statistics of the production, quality controls. I can imagine certain cases where we might have to look at the mix qualities, I mean the mixing routines.

Q. By that, you mean of the rubber?

A. Rubber mixing. Mainly the controls and the testing that is done on rubber mixes, hold tests and things such as that. Their extrusion practices that can be important in certain cases.

Q. What do you mean by extrusion practices?

A. Each of the rubber products are extruded. And there is one manufacturer that I'm evaluating right now that has a problem with their extrusion and the way they handle the extruded rubber.

Q. What is extrusion?

A. The rubber is forced – an [p. 13] extruder is essentially a glorified pump. It mixes rubber and pushes it out through a die to make it into a certain shape.

Q. Anything else that a tire failure expert would want to look at if it were available?

A. Well, that's all I can recall right now.

Q. You mentioned that the primary thing you want to look at is the tire that failed?

A. I forgot the rim. The tire and rim.

Q. And the rim as well?

A. Yes.

Q. What do you do to the tire that failed? What procedures or analysis or tests do you make of the tire that failed?

A. We look at the tire and note its – note its condition.

Q. Anything else?

A. Well, in some cases we have [p. 14] to x-ray. In some rare cases, we get permission to cut the tire. Sometimes we have to cut the tire to find out what we need to know. Certain types of failures. I'm speaking generally about all types of tire failures. There are some tests that can be run, ultrasounds and certain types of chemical tests.

Q. You mentioned that it is important to know the history of the tire before the accident, the pre-accident history?

A. It can be.

Q. Why is that important?

A. It can be important to know the type of use and the type of vehicle that it was mounted on, and –

Q. Why is that important?

A. Well, it can help us find out – explain certain things on the tire.

Q. Helps explain what evidence you see there?

A. It can.

[p. 15] Q. Does it usually help explain what evidence you see there, if you know the history of the tire, type of use, type of experience that that tire has seen?

A. It can be important in certain types of cases.

Q. What types of cases is it important in?

A. Generally, you can – on truck tires, for instance, it is helpful to know how many recaps are on the tire.

Q. Any other type of cases is it important or useful?

A. I think it can be important in almost every type of case in tire forensics.

Q. Do you ever look at the other tires, the non-failure tires, that were on a vehicle at the time of an accident?

A. When they are available, I like to look at them.

Q. Why is it desirable to have [p. 16] information on those tires?

A. Well it can point to – it can give you some circumstantial evidence as to the use of the tire.

Q. In other words, the type of evidence you see on the other non-failure tires would tend to indicate the type of use that the failure tire has seen, if those – all of those tires were on the vehicle at the same time?

A. It can give you some information that helps you decide. It rarely is definitive evidence as to what the subject tire may have experienced. But it can give you some indication of how that tire was used.

* * *

[p. 19] Q. Can worn shoulders ever be evidence of overdeflection?

A. If both of them are worn, it can be overdeflection. And mainly thinking of the case like it – an alignment where you had abnormal wear on the outside shoulder or something like that.

Q. Okay. Is it desirable to have information on the vehicle involved in the accident?

[p. 20] A. Sometimes, yes.

Q. When is that information important?

A. Well, if you have a suspension problem, you would like to know what type of vehicle you have got. There are certain vehicles that have distinctive wear problems even on the best tires. And you would like to know if this tire was mounted on a Ferrari because that might bring into the spectrum a high speed use or something like that, for example.

Q. Well, I guess what I was getting at is even if you know it, that the tire was mounted on a certain type of vehicle, is it important or desirable to actually examine the particular vehicle on which the tire was mounted, as opposed to just having some general information that it was mounted on a certain type of vehicle?

A. It is always desirable to [p. 21] look at the vehicle.

Q. Why?

A. Just to be able to see it to see if there is any abnormal condition.

Q. Without looking at the vehicle, it is difficult to rule out that some abnormal condition in the vehicle may have contributed to the cause of the failure; is that correct?

A. Correct in most cases, yes.

Q. Which cases isn't that correct?

A. There is a great deal of information on the tire. And most abnormal conditions show up on the tire. And so the tire is perhaps the most important. The others are ancillary or extra information that has to be considered.

Q. And it's desirable to consider it; isn't that correct?

A. Yes.

Q. You mentioned that it is [p. 22] important to know how the accident occurred. Why is that desirable?

A. There are certain things that happens to tires that – in an accident that you can see on the tire, but by analyzing the accident you can reinforce your opinion.

Q. Is it important to know what the driver did during the accident sequence?

A. In some cases, yes.

Q. In what cases would that be important?

A. Well, to know if there was heavy braking or to know if there was high speed or high cornering, overload, whatever.

* * *

[p. 24] Q. Would you agree that if part of a tire – of the failed tire is lost or destroyed, tire failure analysis becomes more difficult?

A. In most cases it does. In some cases it matters very little.

Q. And the reason it would be more difficult to do tire failure analysis, if part of the tire is lost or destroyed, is that you have less evidence; is that true?

A. You can say that, yes. In some cases some of the tire pieces that are lost are not the important parts of the failure. In some cases they are.

[p. 25] Q. Where part of a tire is lost or destroyed, would you agree that tire failure analysis becomes more speculative and uncertain than if you had all of those parts?

A. To a certain extent, yes.

Q. And that the conclusions that can be drawn from the tire parts that remain where you don't have all of the tire parts available after the accident, are usually less accurate because of the fact that you have lost some of the evidence that may contain clues as to what happened during the accident?

A. Well, as a general proposition, yes.

* * *

[p. 27] Q. And, again, where the outer belt is not available, because it has been lost or destroyed, that

would make it more difficult to determine the cause of failure?

A. As a general proposition, it would.

Q. And tire failure analysis in [p. 28] that situation becomes more speculative and uncertain?

A. It can.

Q. Is testing something that a tire failure expert would want to do in most cases?

A. It depends on the type of testing.

Q. Well, let me ask you this. In what situations would you, as a tire failure expert, find it desirable to do testing of any type?

A. The most common type of problem that I would run into that involves a lot of testing would be handling studies.

Q. What do you mean by handling studies?

A. Someone says that a tire either aquaplanes – hydroplanes or the car handled incorrectly because of low pressure in a tire. Or because there is some suspension problem. Those are the [p. 29] hardest to quantify mathematically.

Q. Any other type of tire failure analysis where testing would be desirable?

A. You can imagine tests in any type of failure. Testing can be a two-edged sword because testing can be valuable if it is designed correctly. It is very hard to duplicate a lot of factors that may be important.

Q. Why is it hard to duplicate those factors?

A. Well, there is a period of time that elapses. And in many cases in tire forensics, you don't know the exact situation.

Q. When you say you don't know the exact situation, what are you referring to there?

A. The exact conditions that occurred.

Q. That would be things like what operating conditions the tire was [p. 30] exposed to and what happened to the tire as a result of driver input during the accident, what type of maintenance the tire received during its life, those sorts of things?

A. Well, a lot of those things show up on the tire as evidence in the tire. And we don't have to worry about them that much. But in a handling study, there is – there may be certain driver inputs that are – that are best done by testing to show.

For instance, in almost every case where we have evidence of a rear tire that fails, the tire usually goes in the direction of the failure. In other words, if it were on the right side, then the car veers to the right. And then the car loses control to the left because of driver input.

And then in almost every case that we have analyzed or that most accident recon people have analyzed, that [p. 31] is the situation. There is not always physical evidence to that fact in some accidents.

* * *

[p. 32] Q. Why and when do you x-ray?

A. I have had many cases where a separation occurred because of a belt problem, laying the belts on. And in these cases they may have the majority of the tire there, and you can see how the belts were aligned during the manufacture, by x-raying the tire. It is a non-destructive technique.

Q. Any other situation where you do x-ray?

A. Well, I x-ray beads, turn out.

Q. What is the purpose of that?

A. To see how the tire was constructed.

Q. Anything else? Any other occasion where you do x-ray?

A. That's all I can recall except that beads – we x-ray – beads, when they break, usually occur at a overlap in that type of bead construction. On bias ply tires you [p. 33] generally do not break the tire and expose the fractured surface, so there you have to x-ray before you cut.

• • •

[p. 34] Q. Is there any other situation where you would find it desirable to do an x-ray?

A. There are some separations that occur before the tire failure. And sometimes you can x-ray those to determine a separation, the nature and extent of the separation. You can sometimes fail – x-ray tires that are suspected of a separation in processing. You can look at

the wires and determine [p. 35] if there is a separation in process.

Q. Any other occasion?

A. That's all I can recall.

Q. Are there any other tests that you would find desirable or necessary to do in tire failure analysis?

A. Well, as I mentioned, there are chemical tests.

Q. When would you do chemical tests?

A. When you are trying to find the exact cause of the separation.

Q. What type of chemical tests would you do?

A. Well, there is a butal contamination test.

Q. What is that test?

A. To test if the factory has contaminated the rubber with butal rubber.

Q. Any other chemical tests?

A. Those are the ones that I would normally use. I don't normally use [p. 36] chemical tests.

Q. A chemical test, as I understand what you said, would help the tire failure expert to determine the exact cause of separation?

A. Well, it can in some rare cases. Many times we can't determine whether it is a design problem or a manufacturing defect. And certain chemical tests, which are not used very often, can possibly help us determine that.

Q. Is a chemical test necessary to determine what the cause of separation is?

A. No.

Q. Why not?

A. Well, you can determine – in the big scheme of things, you care trying to determine whether this tire was abused or whether it was a manufacturing or design defect. And you can determine that fairly well without chemical tests.

• • •

[p. 37] Q. You said fairly well. Do you know what the error rate or potential error rate of that type of determination is where you do not use chemical tests but rather just do it in other methods?

A. No, I don't.

Q. Have there been any studies published about the known or potential rate of failure of tire failure analysis where you are looking at what caused a separation, but you don't do any type of tests, you just rely on visual inspection?

A. I have never seen a statistical analysis.

Q. And without that type of a study, would you agree that it is impossible to know what the known or potential error rate of tire failure analysis, as I described in the previous question, would be?

A. Well, you can't put a number on it.

[p. 38] Q. You can put a range of accuracy on it?

A. Well, I think that with the indicators we have, based on the experience that we have, you can get a pretty good idea of what had happened. But you can't take a statistical analysis on it without a lot of work.

Q. Can you define what you mean by pretty good idea in that last sentence?

A. I think we are correct within engineering bounds.

Q. What are engineering bounds?

A. Most engineers would use – in statistical terms, if you went through a statistical analysis, they would use a ninety-five percent confidence rate.

Q. So in tire failure analysis where you are looking to determine the cause of separation, if you don't do any tests but just do visual inspection, you believe there is a ninety-five percent [p. 39] chance of accuracy; is that another way of stating what you just said?

A. I think it is somewhere in that range.

Q. What do you base that on, that statement on?

A. Just my experience.

Q. And as I understand it, you have never done any tests or procedure or analysis to verify that ninety-five percent is a correct figure?

A. That's correct.

Q. And you are not aware of any peer review publications that state that ninety-five percent would be a correct figure?

A. Well, I know that all of my testing at Michelin was done to ninety-five percent confidence levels.

Q. Well, I'm asking a specific question on whether you know of any peer review publications in the tire field that would say that the type of procedure [p. 40] that you say is ninety-five percent accurate is, in fact, ninety-five percent accurate?

A. No.

Q. Are you aware of any publications, peer review or not, that talk about that type of tire failure analysis as having a ninety-five percent rate of accuracy?

A. I have not read one.

Q. You stated that you base your statement about the accuracy of this type of analysis on your experience.

A. Yes.

Q. Is that correct? Do you base it on anything else?

A. Well, my experience. And I guess that encompasses everything that I have seen for twenty years or whatever.

Q. What experience in particular do you feel allows you to make the statement that this type of analysis is within the range of accuracy that you [p. 41] stated?

A. Well, I have developed this type of failure on tires through testing. I have seen it in the forensics sense, and I know what causes it.

• • •

[p. 42] Q. You stated that there was a ninety-five percent, I think, range of accuracy; did I hear that accurately?

A. It is a confidence limit. It is a very specific statistical term.

Q. What does a ninety-five percent confidence limit or level mean?

A. It means you might make a mistake one time out of twenty.

Q. And I guess conversely, nineteen times out of twenty, you wouldn't make a mistake?

A. That's correct.

[p. 43] Q. How do you know or how can you determine that your analysis is that accurate?

A. Well, that is based generally on one type of process. It's – it's that – the analogy is testing. If you test tires and measure some quantity, A or B – say, you measure tire A, and it gives you a number, and then you measure tire B, and it gives you another number, then the question is are they different or are they the same. There is variation in every human endeavor. And you have to be able to mathematically determine the risk of whether those tires are the same, whether that measurement is due to normal variation or a real difference in the tires.

Q. With respect to tire failure determination, how can you rule out the inherent problems of isolating – of trying to isolate to a specific cause of separation?

[p. 44] A. Well, each abuse usually leaves a mark on the tire.

* * *

[p. 54] Q. How can you, under your scenario, determine whether you are wrong in your tire failure analysis?

A. The – I cannot put a number on it. I feel that it is within the normal engineering accuracies to make this determination.

[p. 55] Q. But my question is how can you know, if you can know, when you have made the wrong determination?

A. From experience.

Q. So there is no test or procedure that you can go through to determine the accuracy of your analysis?

A. I don't think that this could be put on a statistical basis. If you gave me a couple of million, maybe we could.

* * *

[p. 57] Q. Are there any criteria that you can point to that would tend to lend credence to one person's version of events over the others?

A. Well, how they interpret the data.

Q. So – and that would be a subjective matter; do you agree?

A. It can be. There is subjectivity. There are certain rules that we follow.

Q. What are those rules?

A. Well, if you see polish, you know that the tire separated before the [p. 58] catastrophic failure.

Q. Okay. Is there any other cause of polish?

A. Well, any kind of separation will produce polish.

Q. Define separation for me there.

A. Two parts of a tire are not adhered together.

Q. So if we see polish, as the first thing that you look to, that is the first rule of tire failure analysis?

A. I'm not sure it is the first rule or second rule or third rule, but it is an important rule.

Q. How does one make the determination if polish is present?

A. It is a shiny surface.

Q. Is there some test or method for delineating or pinpointing what is shiny versus what is not shiny?

A. It is usually very apparent what is shiny. It is an unnatural [p. 59] surface when you tear a tire apart.

Q. It is a what?

A. Unnatural surface. There are usually tear marks when you tear a tire apart.

Q. In the scenario where there is a disagreement over whether, quote, polish is present or not, how is that resolved?

A. Generally, if there is a disagreement, it will be as to the conditions of what brought about the separation. Usually, there is very little disagreement about whether separation occurred before the tire failure.

Q. I'm talking about the situation where one person says, "There is polish here," and another person says,

"There is not polish here." How do you resolve that? Is there any test or procedure or method that you can go through to say, "Yes, that is polish," or [p. 60] "No, that is not polish?"

A. I don't think there is a test. Generally, that is not a problem. Usually, there is very little disagreement about whether there is polish there, because it is so evident.

* * *

[p. 61] Q. As I understand what polishing indicates from your testimony, it means that two pieces of the tire came apart and then stayed apart and rubbed against each other for a number of flexing cycles or turns of the tire; is that correct?

A. Yes.

Q. The fact that polishing is present doesn't speak to the causation of separation?

A. Generally not.

Q. So in other words, if you have polishing present, and that's all you have, you can't just based on that, say what the cause of the separation would be?

A. No. It is helpful, of course, to know what surfaces have [p. 62] polished. You can have polish between rubber products or between rubber and steel or some other product. Generally, it is between rubber products. It can be between rubber and the steel product.

Q. As I understand it, just the fact that polishing may be present in a tire that failed does not, by itself, tell you what caused the separation that led to the polishing?

A. That's correct.

Q. So if all you have is polishing, you can't make a tire failure determination?

MR. BAKER: Object to the form.

Q. If that's all you have?

A. You can say that the tire separated, and that caused the failure.

Q. That's it?

A. You can't cause – you can't generally tell exactly what happened to cause the separation without other [p. 63] factors.

Q. You would agree that there are many different causes of separation; is that correct?

A. Yes.

Q. And that the fact that a separation occurs does not mean that there is some defect in the tire that occurred during manufacturing or design?

A. That's correct.

* * *

Q. Well, if all you have is the polishing, and everyone agrees that polishing is there, then you know there has been a separation; is that correct?

[p. 64] A. Yes.

Q. But if that is all there is, you can't go further than that and pinpoint it to a manufacturing defect, or a design defect, or some other cause of separation, since there are many different causes of separation?

A. Well, there was – there is a fairly rare type of separation that indicates the tire was never adhered. In other words, there may have been water in the manufacturing. And it has a slightly different appearance than does the separation that is due to chaff.

Q. Other than that one instance, is my statement correct?

A. As I understand your statement, yes.

* * *

[p. 68] As I understand what I was asking you was you mentioned that there are certain rules that you would follow in trying to determine what caused the tire to fail. And the first thing you said you look for polish, I think you said.

A. Yes.

Q. What other rules or steps or things are you looking for?

A. Well, I guess if you have polish, you have a piece of the tire that is detached or greatly separated. In this case we have a tread that is just detached from the carcass. Once you suspect a separation type of failure, then you have to look at the conditions the tire was operated under to try to eliminate those factors that can cause it that aren't defect or design problems.

[p. 69] Q. What are you looking for there?

A. Well, the primary culprit would be overdeflection.

Q. Anything else?

A. Well, there can be mechanical things that can cause it, but you don't have polish with that type of separation. But that is very, very rare.

Q. Anything else?

A. You always look for impact damage although that generally is not a realistic cause of separation in a tire.

Q. Anything else?

A. You, of course, be aware of structural problems that may have occurred. I mentioned belt misalignment, look at the edge of the belts.

Q. Does that fall under structural as well?

A. Probably. I don't know how you want to organize it. But it might be a structural type thing. May be [p. 70] different. If you have the information available, you look at the wear pattern on the truck, the bead condition, the – I mean the wear pattern on the tread. The bead condition, the wheel condition, the valve core, try to find like the history of the truck, what it was used for, how it was used, how many times.

* * *

[p. 72] Q. Then once you have determined that there is polish and that there has been some type of separation, you are looking for the cause of the separation; is that right?

A. That's correct.

Q. Now, tell me what are the potential causes of separation.

A. I think we just covered that. But –

Q. Is that the list that you were giving me before? I thought that was the list of operating conditions that you are trying to look at to eliminate.

A. Well, I think we said that we [p. 73] had looked at – when you have a separation, the general procedure is that you try to eliminate the operational conditions that can cause the separation.

Q. All right. What are the operational conditions that can cause a separation?

A. As I said, the overdeflected.

Q. What else?

A. In rare cases, you can have a mechanical problem. As I said, you look for impact marks, but that is not a real practical cause of separation.

Q. But it is something you do, right?

A. We look at it just to see the general condition of how the tire was done. It generally does not produce a separation, but it may produce a failure that can be – that may have to be explained, some damage.

Q. What else are the potential causes of separation that result from [p. 74] operating conditions?

A. you can also have, in some rare cases, high speed separations.

Q. Anything else?

A. The – it is theoretically possible that certain types of abuses can cause – like going around curves a lot, continuously, it is possible to produce a separation that way. But it is not practical on the road, because the tire usually wears out beforehand. But that is a theoretical cause of the separation.

Q. Anything else?

A. Well, I'm sure there are thousands of other causes that you could look at. They are very, very rare, you know. The petroleum – sometimes you can have a tire seeped in petroleum, say, due to a mechanical problem, such as a seal that is broken. And although that generally causes sidewall deterioration, it is – I can't recall of a case where it produced a separation in the tread. [p. 75] But it is something that we would look for to see the general condition of the tire.

Q. Anything else that is in that thousands of other causes that are rare?

A. Well, the – most of the thousands of other causes are in manufacturing defects. But, like I say, we are eliminating the operational conditions. We are talking about a different pigeon hole, if you would.

Q. What I'm trying to get from you right now is a list of the potential causes of separation that comes from operating conditions.

A. I think that's a comprehensive list.

Q. Just so we have it in one place. We have overdeflection, mechanical problems, impact damage, high speed, and abuse of the tire in the sense of going around curves a lot continuously?

[p. 76] A. Yeah.

Q. Is there anything else that comes from operational conditions? I think you mentioned the petroleum problem?

A. Well –

Q. Anything else?

A. Overdeflection is described as more or less two different conditions. You can have a tire that, you know, is overdeflected or you can have a tire that is uninflated. We used to – some people use the language underinflated or uninflated. That is quite not the – the underinflated is really should – you should use the word overdeflected better, because it can be overloaded or underinflated and produce essentially the same thing.

Q. When we say overdeflection, that has two subcategories which create the same type of problem with the tire, which is – and those two are overloading [p. 77] and underinflation?

A. Uh-huh (Nodding head).

Q. And as I understand it, it is really the same thing. Because at a certain pressure, the tire can withstand a certain load. And if you overload that tire for that pressure, that is what is overdeflection; is that correct?

A. In some cases you can find the difference between underinflated and overloaded. Generally, the separation is the same. But other parts of the tire may be different. And underinflated – if you run a tire underinflated – I mean uninflated, uninflated, it produces a deterioration in the sidewall.

And in the latter stages of that type of failure scenario, you can produce separations. You don't have to, but some tires do separate. But they have a little different appearance. So generally, an under – an uninflated tire is not that hard to pick out because it [p. 78] has so much damage to the sidewall. Now, another thing you can look at is punctures in the tire. Some punctures can cause separations.

Q. So we should add that to our list, punctures?

A. Yeah. Let's add to that.

* * *

[p. 87] Q. Let's try to summarize what you look for in determining overdeflection. As I understand it, you are looking at wear on the shoulders of the tire, in particular abnormal wear patterns; is that correct?

A. Yes.

Q. You are looking for bead [p. 88] grooves or rim flange impressions; is that correct?

A. Yes.

Q. With respect to certain types of overdeflection, you are looking for cracks in the bead. And that would be the overdeflection caused by overloading the tire at normal operating pressures.

A. Generally, yes.

Q. You are also looking at sidewall deterioration. And that is more prevalent in cases where you have overdeflection caused by underinflation?

A. Yes. Also, the cracks in the bead can also be caused by extreme overinflation. Running with overinflation way beyond the normal rated pressure.

Q. Cracks in the bead can be caused by overinflation or overloading at the recommended pressure?

A. Yes. I forgot that case.

Q. Then, in some cases, you look [p. 89] for deterioration in the sidewall cords; is that correct?

A. Yes.

Q. How do you locate that? I mean, that is on the inside of the tire between the rubber, isn't it?

A. You can see sometimes bulges in the sidewall if it is real bad. It generally isn't seen in cases such as this where you don't suspect a high degree of underinflation.

Q. But if you had that type of sidewall deterioration in the cords, how would it be visible without doing some type of invasive procedure or x-ray or ultrasound or something to see it between the rubber?

A. You can, in some cases, feel it. You can feel a little more flexibility in the thing. It is there. It is – you can't feel it in every tire in every case. But you generally have to x-ray it or cut the – peel the tire [p. 90] open.

Q. Okay. So those are the – did I leave anything out? Those are the pieces of evidence that in trying to determine whether overdeflection was a potential cause of separation, those are the types of things that you are looking for in the tire; is that correct?

A. Generally, yes.

* * *

[p. 92] A. Well, I would come at it from the other way, as I did two weeks ago. That if you have two indicators of overdeflection, then you can be [p. 93] relatively sure that the tire was overdeflected. If you don't have either indicator, of the two major ones, then you really can't prove that the tire was overdeflected.

Q. What are the two major ones?

A. There is – there is – like I said, we are talking about three things. There is sidewall deflection, which is generally – sidewall deterioration, which is generally a mark of extreme overdeflection or underinflated use. Then there is the rim flange impressions. Then there is the abnormal wear on the tread. So that if you had a rim flange impression without a wear problem in the tread, then you would find it very hard to believe that there was that much overloading, or vice versa. If you had neither, then you would be hard pressed to say that the tire was overdeflected.

* * *

[p. 97] Q. Where the tread is lost, you have lost one of the three main indicators for overdeflection. Would you agree that that makes your analysis in trying to rule out the potential cause of separation approximately thirty-three percent less certain?

[p. 98] MR. BAKER: Object to the form.

Q. You don't have that piece of evidence. It is one of the three.

MR. BAKER: Object to the form.

A. No. I think we look at it from a different standpoint. Thirty-three percent, of course – like I say, to prove overdeflection, I think you need two of the three. And you also probably, I guess I should add in there, that you need to eliminate any structural or design problems in each of the things.

For instance, as I mentioned a couple of weeks ago, that there are certain tires that just normally wear on the shoulder. And they were very common a long time ago. So if you just had the tread, you might have to look at some other tires to prove overloading just from that evidence of the tread.

* * *

[p. 111] Q. Do you agree that a tire that is run overdeflected is more susceptible to impact damage?

A. Yes.

Q. Then the next potential cause of separation from operating conditions that you listed was high speed.

A. Yes.

Q. What evidence would you look for to make that determination or to rule out that determination?

A. Well, the tread is one area. In the separation area you can usually see to patterns of high temperature.

Q. What does that look like?

A. Generally a bluing of the rubber.

Q. Will that look darker or lighter than the surrounding rubber?

A. Well, it is a different color.

* * *

[p. 114] Q. And one of the causes of high temperature is high speed?

A. That's correct.

Q. What are the other causes of high temperature?

A. Well, you can have a deformity in the tire that makes a hot spot. You can have a rubber that is more susceptible, of course, to a temperature – I mean less resistance to temperature. You can have, in some cases, overloading under certain conditions can cause higher temperatures.

Q. Underinflation?

A. Yes. They all produce increase in temperature.

Q. So if you had bluing that would be another indicator of overdeflection potential?

A. It's possible. Yes.

* * *

[p. 115] Q. It is not only possible, it is likely, isn't it. If you have overdeflection, that increases the heat which would cause bluing, right?

MR. BAKER: Object to the form.

A. You – I guess we are arguing about semantics. It can be an indicator of overdeflection, yes. We don't see it all the time, because generally the tire is not allowed to, shall we say, get to a certain temperature. It is a combination of ambient conditions, tread depth, the working of

the tire, and how quickly it fails. If the tire sticks together under the conditions for a long time, then you are more likely to have the bluing. But once you have the separation develop and polishing starting, then you may either wear away the rubber that has blued, or it may relieve the stress that would cause the overtemperature, once your [p. 116] separation starts.

Q. Well, once bluing exists, it is there forever, right?

A. It can be in certain areas. If it is rubbed, then I don't think it stays there. If there is a lot of abrasion in the tire, I think the bluing goes away. I can't be definite about that. But you generally see bluing in an area that is peripheral to the or adjacent to the – wrong word – adjacent to the polishing..

Q. Because that is where the heat would be the highest?

A. Yeah. This is probably where the tire is being flexed, but it hasn't formed a separation yet.

* * *

[p. 118] Q. Okay. High speed is a very rare cause of separation?

A. Yes.

Q. The next one you listed for us as a potential cause of separation resulting from operating conditions is abuse in the sense of going around curves a lot continuously.

A. Yes.

[p. 119] Q. I think you also said that is very rare.

A. It is very rare to cause a separation.

Q. What would the evidence on a tire look like that would allow you to make that determination, that abuse in going around curves a lot continuously caused the separation?

A. You would generally see scuffing on the sidewall and abnormal wear in the tread.

Q. Anything else?

A. That's all I can recall now.

Q. Then you mentioned punctures as another operating condition that can cause separation. What are you looking for there?

A. A hole in the tread. Then you look for polishing around that hole between the belts. Look for fraying of the wires.

Q. Anything else?

[p. 120] A. Just the evidence that – you have to follow that to where the tire separated. You can follow the separation by the polish.

Q. If you had a puncture that caused a slow leak that led to underinflation and resulting overdeflection, and the overdeflection – I take it then the overdeflection would be your cause of separation rather than your puncture; is that right? Just trying to distinguish between those two categories.

A. Yeah. I see what you are saying. In every case you see where a puncture has caused overdeflection, you see the rim flange impressions and wear.

Q. Abnormal wear on the tread?

A. Abnormal wear on the shoulders.

Q. Those would be some of the tell-tale signs that a puncture caused the overdeflection?

[p. 121] A. Yes.

Q. So if you had a puncture, abnormal tread wear, and rim flange impressions, that would be evidence that would lead to a determination that puncture was the cause of overdeflection which was the cause of the separation?

A. That's correct. If you can eliminate the other factors that might be caused, we see that quite often.

Q. All right. That is not uncommon?

A. Not uncommon at all.

Q. Then you mentioned thousands of other causes that are rare. Again we are talking about operating conditions as opposed to manufacturing defects or design defects. You mentioned just one, which was petroleum seepage. What would you find there?

A. It is very easy to find. You see a softening of the external rubber. Changes appearance and becomes – it can [p. 122] actually revert to a gummy-type rubber.

Q. Anything else?

A. No.

Q. Are there any other operating conditions that cause separation that we haven't covered?

A. I think those are the biggies.

Q. Now, when you say biggies, you are implying that there are some smaller ones that are more rare; is that correct?

A. I'm trying to leave the door open if I remember anything later on. And I will tell you if I do.

Q. Please do, because I am trying to get a definitive list. As I understand what you do in trying to determine the cause of separation is you basically do it by a process of elimination; is that correct?

A. That is a fair description.

Q. And the first thing you are [p. 123] trying to do is eliminate the operational conditions that cause and are known to cause separation. And you do that by looking at the evidence we have just gone over to see if there is any of that present in the tire; is that correct?

A. That's correct.

Q. What do you do after that? Say you go through that and you find – well, let me withdraw that.

Where you have some evidence that points to one of these, what do you do with respect to trying to rule that particular item out?

A. Well, edge belt separations have a few different classifications in them.

Q. I – is it edge belt separation – that is one of the types of separation that can result from an operating condition?

A. That's the most common type of separation. It's the one that is [p. 124] generally caused by the over-deflection.

Q. Okay.

A. The – there are some that are very regular where you have the edge of the belts that are worn clean all the way around the circumference. And then there are others that have the characteristics – half moon type shape. It is fairly localized until the tire flies apart. And you have a half moon or deterioration of polish in the area, and you generally assume that that is where it started.

Q. That is in an edge belt separation?

A. Yes.

Q. Or belt edge separation?

A. Yes.

Q. What is it, edge belt or belt edge?

A. I don't care.

Q. When you have that half moon, what does that tell you?

[p. 125] A. It generally means that separation formed in one area and grooved to a certain area. Then the tire came apart fairly rapidly thereafter. The separation can grow in different ways. They can form – they usually form in one place and then grow around the tread along the edge of the belts. And you can see that fairly well by looking at the edge of the belt wires. They will all be rubbed clean.

In a lot of tires when you decordicate them at the end of their tread life, you will see this. And there are attempts to quantify that. We had certain guidelines at Michelin with our tires there. And if you look at tires, you come up with a certain measurement of what is normal when you take a tire apart at the end of its life or when you see it when it is separated halfway through. You can see that maybe this is one that formed a separation all the way around [p. 126] the tire at the edge of the belts and then came apart.

Q. The fact that you have that type of separation, does that tell you the cause? I mean as I understand it, you said overdeflection is very often the cause of that type of separation. But does the fact that you have that type of separation tell you the cause?

A. It leads you more toward the fact that there may be a design problem, since it is less localized and many contaminants can be localized. It does not provide a definitive proof of one type or the other.

Q. When you say definitive proof of one type over the other, you are talking about one type of cause of separation over some other type of cause?

A. Assuming that it is a manufacturing defect, it does not help you decide between a design problem or a contamination problem.

[p. 127] Q. I guess what I'm getting to is if you have that type of separation, do you decide whether it is an operating condition that caused it as opposed to a manufacture or design problem?

A. No. You still have to eliminate the other factors.

Q. If you can't eliminate the other factors, then you can't make a determination as to why the separation occurred; is that correct?

A. You can't prove that there was overdeflection, then.

Q. You can't disprove it was overdeflection?

A. Well, as I phrase it, my semantics, you have to have the two qualities to prove that there was overdeflection.

Q. So what you are saying is the manufacturer is presumed guilty until proven innocent. In other words you presume there is a manufacturing design [p. 128] defect unless you can rule out that there was some operating condition; is that correct?

MR. BAKER: Object to the form.

A. Well, what the nature of these separations is that you are going to get a separation in a tire sooner or later. Hopefully, it will be past the time that you wear the tread off. And that should be a design consideration. I mean, that should be a design fact. The degree upon which you have a separation is what – what is important. You can hasten its end by overdeflecting it.

Q. Or abusing it in some other fashion as we have discussed?

A. That's correct.

Q. All of the different operating conditions that cause separation before the life of the tire ends; is that right?

A. They leave marks on the tire, [p. 129] usually.

Q. What you are saying is, the way you go about your analysis is if you have a separation, you presume it is a manufacturing or design defect, and then you try to eliminate the potential operating conditions as cause of the separation. And if you can eliminate all of them, or if there is just insufficient evidence that one of those operating conditions may have caused it, then ipso facto, it is a manufacturing or design defect?

MR. BAKER: Object to the form.

A. A long question or statement. I don't presume that the manufacturing is guilty in any case until I can prove it.

Q. But the process that you have described in proving it is that you look for potential causes of separation that result from operating conditions?

A. Yes.

[p. 130] Q. And if you find insufficient evidence of those, then you say, "Aha, it must be a manufacturing or design defect;" is that correct?

MR. BAKER: Object to the form.

Q. Is that correct?

A. I'm not sure I would use those words. But essentially if you have a separation, in the process of finding out what caused it, you have to eliminate all of the factors of abuse, and then it will be the only thing left is that it is a manufacturing or contamination or design defect.

Q. And if you cannot – if the evidence is equivocal on the operating conditions being causes of separation – that is, you have some, but under your criteria, not enough, then you just rule those out and you say, "It must be a manufacturing or design defect;" is that right?

[p. 131] A. If you can't eliminate the operational factors, then I send the tire back.

Q. What do you mean by that?

A. I don't make a determination of it. I send it back to whoever sent it to me saying I can't decide.

Q. In how many cases since you have worked for George Edwards have you done that?

A. Generally, about half of the – half or more of the tires that we get get sent back.

Q. Is that since you have worked for George Edwards, you have sent half of the tires that were sent to you for analysis, you sent those back to the person who sent it to you saying, "I can't make a determination?"

A. Probably.

Q. If we wanted to check your statement you just made, how would we do that?

[p. 132] A. Wait a minute. I have to include the ones that I say that there is no evidence of a manufacturing problem. Okay? Half of the tires that we get we – we tell them that they do not have – that it was not the manufacturer's fault.

Q. All right. So let's say, just for argument sake, you have had a hundred tires that you have looked at since

you worked for Edwards. Fifty of those tires you sent back saying, "There is no fault on the part of the manufacturer?"

A. At least.

Q. Do you ever say there is insufficient evidence to determine what caused it?

A. Yes.

Q. One way or the other?

A. Yes.

Q. How many tires fall in that category?

A. Probably five or ten.

* * *

[p. 133] Q. Tell me how you would determine there was no manufacturing or design defect in the – as being the cause of separation.

A. There are signs of abuse on the tire.

Q. In other words, you would find evidence that is sufficient under your criteria that we have gone over that points to one of the factors that are known to cause separation as a result of operating conditions?

A. That's right.

Q. And when you have evidence that – take the example of overdeflection. Say you have rim flange impressions. But because the tread is [p. 134] lost, you don't have abnormal wear patterns and you don't have sidewall deterioration, as I understand your testimony,

you are saying that is insufficient evidence to say overdeflection caused the separation; is that correct?

A. In some cases.

Q. What cases would those be?

A. Well, as I said before, if you had a very severe rim flange impression, and that was all you had, you didn't have the tread or you had no sidewall deflection, you would probably not criticize the manufacturer.

Q. Let's eliminate that category. Say you had medium rim flange impressions. And that's all you had. Tread was lost. No sidewall deterioration. In that situation, as I understand your testimony, your conclusion would be there is insufficient evidence of overdeflection as being the [p. 135] cause of separation.

And say you didn't have any evidence pointing to any of the other operating conditions as causing the separation. In that situation you would say, "Must be a design or manufacturing defect;" is that correct?

A. It is possible that that could be the conclusion. I won't say that it happens in every case. If I only had a medium rim flange impression, which is hard to define. If I had a light one, then I would probably go ahead with, you know, trying to find out everything else I had about the tire in looking at it very carefully.

A small rim flange impression is not an indicator of overloading by itself. And generally is not an indicator that it is overloaded. A medium is generally not. But that gets into the gray area where you have to define, you know, what is medium, what it [p. 136] looks like. And then you try to find other things.

Q. That is a subjective definition?

A. Well, it is usually pretty clear cut, more than what your language would indicate.

Q. I thought you said that it was a gray area.

A. It is a gray area.

Q. Which would indicate it is not clear cut and would be a lot of subjectivity in making that determination.

A. That's right.

Q. Let me just stop you right there. What you are saying is, as I understand it, you don't know whether overdeflection caused the separation or not in that situation; is that correct?

A. It is a little more – it is harder to criticize the manufacturer in many cases like that.

[p. 137] Q. There is uncertainty and there is speculation and subjectivity about whether overdeflection causes separation?

A. Right.

Q. And then in that situation, you know, under your scenario, if you don't have two of the three, you say, "Got to rule it out, must be a manufacturing or design defect."

MR. BAKER: Object to the form.

A. Well, this is probably poor language. I always give – I generally give the manufacturer the benefit of the doubt on these things.

Q. How can – how do we know that?

A. Well, if I can't prove it, that it was overdeflect – that it was a manufacturing defect by a process of elimination, then I don't go ahead.

* * *

[p. 181] Q. Do you believe that tire failure analysis is a procedure that is [p. 182] conducted according to the scientific method?

A. I believe so.

Q. Define what you mean by scientific method.

A. It is a procedure that is designed to eliminate as many variables as possible.

Q. And why do you believe that tire failure analysis meets that definition?

A. Well, I believe that it is based on evidence and not emotion. And based on rules that are followed.

* * *

[p. 183] Q. With respect to this one course that you took out in California from the North Florida School, is that the only course that you have taken in tire failure analysis?

A. It's the only one I know of that exists. That is the only one I have [p. 184] taken, yes.

Q. How long ago did you take that?

A. Three or four years ago. Maybe Five. I don't know.

Q. How long is the school or the seminar?

A. It was a week. A week-long seminar.

Q. Is there any test at the end of it?

A. No.

Q. There is no certification or test or make sure that the person who takes the course has absorbed the material and information and can properly do an analysis; is that correct?

A. No. We got some kind of certificate. But I think that was mainly for the cops that took it.

Q. There is no board that licenses or certificates or monitors tire failure experts or analysts, is there?

[p. 185] A. Not that I know of.

Q. Are there any industry standards that you are aware of that are published that govern or regulate how a tire failure determination is made?

A. I know of none.

* * *

Q. There is nothing like a – the bar association or the medical association that licenses and monitors people who are tire failure analysts, is there?

A. I don't think there is anything like that. The only experience I have is I know there are certain professions that require a certain body of knowledge to be known, and engineers and attorneys are in that – in that [p. 186] group of professions. Like I have a PE, and y'all have a bar exam or whatever – whatever y'all call it or something like that.

So that is all I know about it. I don't think there is anything that would specify a tire forensic engineer or something like that. I don't know of anything along those lines.

Q. Now, I understand that you worked for Michelin for about ten years; is that correct?

A. Approximately ten years.

* * *

[p. 219] Q. While you were at Michelin, you didn't did do any work in the warranty or claims area inspecting tires [p. 220] that failed in field operating conditions as opposed to on a machine or test rack?

A. Yes, I did.

Q. You did?

A. Yes.

Q. You did have warranty claims experience?

A. We had tires that were brought to us from failures in the field, and that was a wide variety – they were essentially adjusted tires.

Q. When you say essentially adjusted tires, what does that mean?

A. That means the tires that the customer had a complaint about.

Q. You didn't list that experience on your resumé; is that right?

A. I don't think so.

Q. And what was the experience that you claim you have in this warranty or claim adjustment area?

A. Certain tires were shown to [p. 221] us as designers to show us what could happen to tires out in the field so that we could be better tire designers.

Q. Well, did you do any tire failure analysis on any of those tires that were brought to you?

A. We did some, yes.

Q. Did you do some?

A. Yes.

Q. And what type of work did you do there?

A. Well, we looked at the tires to determine why they failed to make sure that – this is mainly due to try to improve us as designers to show us –

Q. These were Michelin tires?

A. Mostly, yes.

* * *

[p. 254] Q. Let me make sure I'm clear here. Can you have any weakening of the tire cohesion caused by overdeflection that does not leave the rim grooves, the abnormal wear on the shoulder, or the deterioration of the shoulder – of the sidewall?

A. Well, I don't think so.

Q. So whenever you have overdeflection that damages the tire integrity, its cohesive properties of the [p. 255] rubber, you are going to have one of those signs, in your opinion?

A. You should have at least two.

Q. What do you base that statement on?

A. Experience.

Q. And as I understand it, you don't know what the – we have been over this – you don't know what the accuracy of your statement is, other than that you have just – just have experience and you think that is what it is?

A. Well, experience has taught me that is what it is.

Q. You haven't ever done any analysis to determine the known or potential rate of error of your analytical technique?

A. No.

Q. With respect to separation, what evidence is specific only to separation caused by a manufacturing defect or design defect as opposed to [p. 256] some other cause of separation?

A. Well, a separation that is caused by those factors would generally not have the wear – the abuse factors. The abuse indicators.

Q. So it is really a lack of evidence?

A. Yes.

Q. That would pinpoint a manufacturing defect or a design defect as the cause of the separation, in your opinion?

A. Yes.

Q. And that lack of evidence would be lack of evidence of abuse or operating conditions as a potential cause?

A. Yeah.

* * *

[p. 375] Q. Is there anything that you have asked for that you haven't received?

A. I believe that there are some requests that were made for y'all to produce certain documents that have not been received yet.

Q. That is information that you want?

A. I believe so, yes.

Q. What specifically are you referring to there?

A. Adjustment records.

Q. How would those be significant to you?

A. I would like to see the general pattern of returns for separations on these tires.

Q. Well, the general pattern [p. 376] wouldn't tell you anything about this specific tire; is that correct?

A. It could.

Q. It could?

A. Yes, it could.

Q. Is that what you said? How so?

A. Well, the general level of separations based on the number of tires produced is information that would be valuable.

Q. How would that b· valuable?

A. It would determine – help me determine whether this is an engineering problem or a manufacturing problem.

Q. Would it be valuable for any other purpose?

A. That is the major cause. The level also tells you whether this is a problem tire.

Q. What type of percentages would you be looking for as far as returns due to alleged separation before [p. 377] you could conclude that there was some type of design problem?

A. Well, anything over one percent I think would be unacceptable for separations. That is not to imply that one percent is an acceptable level for separations, but that is a fairly high value for the industry.

Q. Just so we understand what the one percent is, that would be one percent of tires manufactured and sold that were returned due to an alleged separation?

A. Yes. All types of separations in the tread. Generally referred to as either a tread separation or belt separation. Some people confuse the two terms.

Q. Does that one percent take into account separations due to abuse or overdeflection or some other cause other than a manufacturing or design problem?

A. Yes.

[p. 378] Q. So what you are saying is if you get the Kumho adjustment data, you are assuming that it exists,

and that data were to show separations above one percent of tires manufactured, that is more than one percent of the tires manufactured were returned to the company on an alleged separation problem, then that would be significant to you?

A. Yes, sir.

Q. And how would that be significant?

A. Well, it would be a level that would be higher than most of the industry.

Q. So what would that indicate to you?

A. That the tire is weaker than the rest of the industry.

Q. Okay. What if the percentage were below one percent, what would that indicate to you?

A. Well, then it would be within [p. 379] the industry, depending on, you know, the average of the industry. Depending on how low it was.

Q. What is the industry average?

A. Well, for some tires it is around a half a percent for separations.

Q. You said the industry average for some tires is half a percent?

A. Yes.

Q. Which tires are you referring to there?

A. Well, that would be normal average quality type tire.

Q. Are you referring to certain specific manufacturers when you make that statement?

A. Well, generally, the brand. There are – there are tires that are either high performance tires or high quality tires, you know, the premium tires that are made that would have a lower rate.

Q. But what you are saying is [p. 380] the point five percent is the industry standard or average for returns of tires due to alleged separation; is that correct?

A. I think that is considered an acceptable level.

Q. Do you consider that an acceptable level?

A. No.

Q. What do you consider an acceptable level?

A. I would like to see it as close to zero as possible. There is always going to be a certain amount that are returned by, you know, that have problems that are due to the customer.

Q. And how do you quantify that? How do you segregate those out?

A. Well, the – it's hard sometimes to separate those. Almost everytime.

Q. What do you mean by there are going to be some that are returned due to [p. 381] problems by the customer?

A. Well, customers abuse things. They abuse the tires. That can cause separations. From the data I see, there is a lot of ride and handling complaints with tires

that cause adjustments. These can either be a simple thing like not mounting – not balancing them correctly or it could be the precursor to a separation.

Q. Do you have a level that you feel that is acceptable?

A. As close to zero as possible, due to the manufacture.

Q. If you can't segregate out the tires that are returned due to some customer originated problem, how are these figures at all useful?

A. Well, I know what the average is, and you have to assume that Kumho customers are the same as Firestone or general customers.

Q. You say you know what the [p. 382] average is. What do you mean by that?

A. I have data from other manufacturers that shows separations.

Q. We are talking, I think, apples and oranges here. What I'm getting at is there are certain tires that are returned under a warranty program for adjustment.

A. That's right.

Q. And the customer or whoever it is who takes the tire and says, "This is a separation problem," or "This is a tread separation problem," or "This is a belt separation problem," and those are the ones we are talking about, is that right, those types of problems?

A. Yes.

Q. As I understand it, when those tires come back to the dealer or to the manufacturer with that complaint, it may be a true complaint or it may be something that is not correct. I mean, the customer may be wrong.

[p. 383] A. That's right.

Q. Is that correct?

A. That's correct.

Q. And then on top of that, you have customer originated problems versus design and manufacturing problems; is that correct?

A. Yes.

Q. How do you segregate those out?

A. Well, the easiest way is that you see a change in the adjustment rates over time. And then you correlate to some change in the production.

Q. How can you make that correlation?

A. I would have to have the data.

Q. Well, what I'm trying to figure out, though, is if – if you have not actually gone through and done some type of review of the tires to say, "Okay, these are due to customer [p. 384] originated problems, and this other group over there are due to design or manufacturing problems," how can you say with any sort of certainty that the drop in the number of returns due to alleged separation would be because of manufacturing improvements as opposed to the fact that, well, a group of customers didn't abuse the tires?

A. Well, I don't think you can assume that the customers change over time dramatically. We can see that when, say, a certain manufacturer changes the skim stock and their adjustment rates go through the roof, then you can correlate that back to the skim stock or some other manufacturing change.

Or if they come out with a new tire, and all of the sudden their experience with similar tires is one level, and then it goes to another level, then you can correlate that back to the tire change.

[p. 385] Q. you are assuming that there is no change in consumer habits or change in consumer use or some other consumer oriented or originated problem that would influence the figures.

A. Well, it has to be, you know, a similar tire. In other words, you can't compare a light truck tire to a passenger tire. Most of the time you can't compare those, because they have different usage. But if you have passenger tires that are the same level, and then all of the sudden another passenger tire comes out, and it has a different experience, then you can relate it back to the tire.

Or if you have a light truck tire that comes along, some change is made and then the adjustment rates change, then you can relate it to that.

* * *

[p. 512] Q. We have gone over previously that just the fact that there is [p. 513] polish – polishing present on the tire, or that there may be chaff present on a tire does

not mean that there is a manufacturing defect or design defect; is that correct?

A. That's correct.

Q. It just means that there was a separation for some reason?

A. That's right.

Q. Which led to that polishing and chaff?

A. Yes.

Q. And separations can be caused by several different factors that we have gone over previously; isn't that correct?

A. That's correct.

Q. Just the fact that there is a separation doesn't mean that there is a design defect or a manufacturing defect?

A. That's correct.

Q. We talked about in the Carmichael case the fact that most tires come out of service because the tread [p. 514] wears out; isn't that correct?

A. That's correct.

Q. For that group of tires that comes out of service or fails before the tread wears out, what percentage of those tires do so because of some sort of abuse as opposed to a manufacturing or design defect?

A. I don't know.

Q. You have no data on that, nothing that you can give me on that?

A. I have a lot of data. I probably could figure that out from the data that I have, but I have not made that calculation.

Q. What data do you have?

A. I have a lot of adjustment records and I have a lot of other types of records similar to that. Similar to the adjustment records.

Q. Isn't it true that most tires that come out of service at that stage, before the tread wears out, come out of [p. 515] service because of abuse?

MR. BAKER: Object to the form.

Q. Some type of abuse, whether it be a puncture or impact or overdeflection or some other type of abuse. We have gone over all of those different categories previously.

MR. BAKER: Object to the form.

A. I would think so, yes.

Q. Isn't it true that the – that you have testified previously in the Carmichael case that you believe the numbers in the industry were somewhere between point five rcent to twenty percent of – only point five to twer percent of the tires come out of service at that stage before the tread wears out due to some manufacturing or design defect?

A. I think that is generally correct, yes.

[p. 516] Q. So that it is fair to say that the vast majority of tires that come out of service before the tread wears out come out of service due to abuse, whether it is

overdeflection or puncture or impact or some other type of abuse, as opposed to a design or manufacturing defect?

MR. BAKER: Object to the form.

A. Yes.

* * *

[p. 517] Q. (By MR. BABINGTON) Let me state the question again. If there are no signs of abuse on the tire – which you think is true in this case, right?

A. That's correct.

Q. And also no signs on the tire of a design or manufacturing defect, then how is it logical or reasonable, based on a statistical analysis, to conclude that there is a design or manufacturing defect where the vast majority of tires that come out of service before the tread wears out do so because of abuse?

[p. 518] A. You have kind of gone into an apples and oranges thing. You started out saying if there is no signs of abuse, then you talk about abuse as most tires have failed. Most tires that fail before they wear out have obvious signs of abuse on them. There is a big hole in them, they have been curbed or run flat or something of that nature.

Of the tires that have separation failure, something has to cause the separation to start. It is either abuse, which leaves a sign, or it is a manufacturing defect because it wasn't made strong enough, or there is a mistake in the way it was made.

* * *

[p. 564] Q. What is your criticism of the design of this tire?

A. If there is a criticism of the design, which I can't tell, it would be in the quality of the skim stock.

Q. So what you are saying is either that one batch of skim stock got [p. 565] bad or they just had a bad chemical formula?

A. Exactly.

Q. One or the other?

A. Exactly.

Q. And you can't tell?

A. Cannot tell.

Q. And that is the same opinion that you have really with respect to the Carmichael case?

A. Yes. With one batch being bad, that can be a variety of factors. The contamination or the fact that the skim stock or the cushion gum or whatever is overaged, or something like that.

Q. You can have a separation that occurs in a skim stock due to the tire becoming weakened at that point as a result of overheating due to overdeflection; isn't that correct?

A. Yes.

Q. So the mere location of the failure at a certain point doesn't mean [p. 566] that that point contains some defectively manufactured or designed ingredient?

A. No.

Q. Do you know if the Superior Twelve, which is the type of tire at issue in Carmichael, and the Buckshot, this tire, have the same green casing?

A. No, I don't.

Q. Have you done any further work on that issue by reviewing more tires or getting additional information from any source?

A. No, I have not.

* * *

[p. 649] Q. Just so I don't have to repeat it all. As I understand what you said in this case concerning the Tillery tire would be the same for the Carmichael tire; is that right?

A. Yes.

Q. That it is either design or manufacturing. If it is design, it is [p. 650] those things we listed and nothing else. And if it is manufacture, it is those things and nothing else; is that correct?

A. That's correct.

Q. In your earlier deposition, we had asked you some questions about your arrangement with Mr. Edwards. And it sounds like there have been some developments that he has now pretty much retired; is that correct?

A. Yeah.

Q. He is retired now?

A. He is not taking any new depositions. If a case has progressed to the – if he has given a deposition in the case, he will finish it out. If he has not, then we will try, you know, for me to do the case.

Q. Okay. And have you reached any firmer conclusion about your business dealings?

A. About my what?

Q. Your business dealings with [p. 651] him.

A. Yes. We have a contract now.

Q. What does that contract state? Is it a written contract?

A. Yes.

Q. And what does that contract say?

A. Essentially, that I'm paid a certain salary. And at some point we will decide whether I will agree to take over the company.

Q. When is that point?

A. It could be the first of next year.

Q. Is it left vague, or does it state a specific date?

A. It is up to Mr. Edwards.

Q. But he has told you the first of next year?

A. That is when we will make the decision – if I make the decision I'm going to stay with him and he makes the decision whether he wants me to take it [p. 652] over.

Q. That is January of 1996?

A. That is the date that he has quoted. It may be earlier.

* * *

[p. 659] Q. You would agree that in order to make this transition between you and Edwards effective, it is essential that you agree with Edwards' opinions as much as possible.

MR. BAKER: Object to the [p. 660] form.

A. No.

Q. You don't think that is essential?

A. No.

Q. Well, in the case that you disagreed with Edwards, you had to withdraw, right?

A. Yes, sir.

Q. So that doesn't result in any revenues coming into the company, right?

A. No.

Q. If that happened in every case, the company would go out of business, wouldn't it?

A. We have so much work it would be good to get rid of some of the cases.

Q. If on the cases that are being transitioned, if you disagreed with Edwards on every one, that would result in a much reduced revenue for the firm, wouldn't it?

MR. BAXTER: Object to the [p. 661] form. I don't think that is what he said.

A. Not really.

* * *

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION
[Caption Omitted In Printing]

testimony of THOMAS MICHAEL DODSON,

* * *

19th day of January, 1996, commencing at approximately 8:35 o'clock, A.M.

* * *

[p. 44] oversimplistic?

A Of course.

Q It is oversimplistic?

A Yes.

Q All right. Is there a mixture process that occurs during the manufacturing of the tire?

A Several.

Q All right. And can any of those mixture processes cause a defect or the failure to properly mix cause a defect?

MR. BABINGTON: Object to the form.

A Well, I think it's a hypothetical question without nearly enough detail. I mean, can something happen? Lots of cans can happen. Does it happen with any degree of regularity? No.

Q How do you know that?

A Based on my experience of being in the tire industry.

Q All right. Well, I mean, you are in the tire industry. How would you know whether or not defects occur during the mixture process of making the tire?

A From examining the tires after they become [p. 45] unserviceable to see if there is any problem with them.

Q What's the term that's used when tires are sent back by the retailers before they are sold or after they are sold and someone comes in and says, hey, this tire is not holding air? What's that called?

A I am not sure what you are talking about.

Q I can't think of the word. Maybe I will think of it.

Do you have any experience or knowledge of the procedure that is used by tire manufacturers to recall or reclaim tires that may have a defect in them? A manufacturing defect in them?

MR. BABINGTON: Objection.

BY MR. JACKSON:

Q I am not saying a manufacturing defect that causes a separation. It could be caused before then.

MR. BABINGTON: Object to the form.

A Are you asking me the procedure that a manufacturer would go through if they wanted to recall a tire? Is that what you are saying?

BY MR. JACKSON:

[p. 46] Q No, sir. I guess what I am asking is how would the manufacturer go about knowing that a recall may be necessary?

MR. BABINGTON: Object to form.

A I couldn't answer that. Seems to me like that's speculation.

BY MR. JACKSON:

Q Well, I don't want you to speculate. I am asking you if you know, based on your experience that you have in the tire industry?

A Well, I mean, I don't see where there is an answer to that question. It's a hypothetical question. What would a manufacturer know or how would they go about knowing to decide if they needed to bring back a tire? That's a very case-specific situation, sir.

Q Well, can you give me any case-specific answers? I mean, largest manufacturer of cigarettes in the country just recalled a billion dollars worth of cigarettes. Something triggered something for them to recall those cigarettes.

What happens in the tire industry, if you know?

[p. 47] MR. BABINGTON: Object to the form.

A No, I do not know any specifics about what might trigger a manufacturer to do that.

BY MR. JACKSON:

Q Have you ever heard of a manufacturer recalling any of its tires?

A Sure.

Q Can you think of any specifics?

MR. BABINGTON: Object to the form.

A As far as what triggered them to do it, no, sir, I can't.

BY MR. JACKSON:.

Q All right. Without answering what triggered it, I just want to know can you recall there ever being a situation where a manufacturer recalled some tires?

MR. BABINGTON: It's been answered.

A Sure.

BY MR. JACKSON:.

Q All right. Can you tell me who? When? Where?

A Not specifics, but I can tell you that lots of manufacturers have recalled tires from time to time

* * *

Plaintiff's Response To Defendants' Motion To Exclude

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

[Caption Omitted In Printing]

AFFIDAVIT

Before me, the undersigned authority, personally appeared Dennis Carlson who first being made known to me and duly sworn to speak the truth deposes and says as follows:

"My name is Dennis Carlson and I have been retained as an expert witness in the above styled cause. I am over the age of 21 years and I reside in Louisville, Kentucky. I have a bachelor of mechanical engineering degree as well as a masters degree in mechanical engineering. I have many years of experience in the areas of tire analysis and failure, as well as vehicle handling and accident reconstruction. My experience in these areas includes thousands of tire "control failure" tests. I have been retained by counsel for the Plaintiffs to examine the tire made the basis of this lawsuit and the Plaintiffs' claims and provide an opinion and report as to my findings.

I received the accident tire (right rear on Aerostar Van) in the laboratory and examined it on July 1, 1993. This tire is identified as a Hercules Superior XII, size P205/75R14 and having DOT Serial Number H2ADYPU068 indicating it was manufactured by the

Samyang Tire, Inc. Kwangsan-gun, Chonnam, Korea during the 6th week of 1978. "Made in Korea" was molded into the sidewall. The tread and outer steel belt had separated and completely detached from the tire cord body. Three of these tread and belt fragments were found at the scene of the accident and accompanied the tire. During its service life this tire was penetrated by an object such as a nail. The tire was removed from the rim and a chemical cure patch was satisfactorily applied to the inner-liner. The rim flange impressions at the upper heel of the bead were normal, indicating the tire had not been operated overloaded or underinflated. The tread depth remaining was 3/32". Circumferential nylon plies were placed over both steel belt edges.

The tread and belt separation initiated at the steel belt edges. The laminated surfaces showed evidence of insufficient adhesion between various interfaces. Chafe and polish was evident, indicating the separation preexisted the tire failure over a prolonged period of time. In my opinion, the tire failed as the result of a manufacturing defect in the form of insufficient adhesion. My opinion is to a reasonable degree of engineering certainty and is based upon my review and analysis of the tire combined with my training, education and experience.

I have attached as Exhibit "A" hereto a copy of my curriculum vitae (CV) outlining my training, experience and credentials."

FURTHER AFFIANT SAYETH NOT.

/s/ Dennis Carlson
DENNIS CARLSON

STATE OF KENTUCKY)
COUNTY OF Jefferson)

Subscribed and sworn to before me on this
the 15 day of February, 1996.

/s/ Ann Tumblein
NOTARY PUBLIC
My Commission expires: May 16, 1996

Exhibit "A" to the Affidavit of Dennis Carlson

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

PROFESSIONAL RESUME OF DENNIS CARLSON, JR.
AUGUST 1994

I. General Information

A. Position: Tire consultant
George R. Edwards, Inc.
The Edwards Building
4000 Shelbyville Rd.
Louisville, Kentucky 40207
Telephone: 502/893-3686
Fax: 502-896-6289

II. Professional Summary

A. Education: Bachelor of Mechanical Engineering
Georgia Institute of Technology
1970

Master of Science in
Mechanical Engineering (M.S.M.E.)
Georgia Institute of Technology
1978

B. Experience:

August 1994 to present
Position: Tire Consultant and Accident Reconstructionist
George R. Edwards, Inc.

November 1987 to August 1994
Position: Senior Project Engineer
S.E.A., Inc.
Lawrenceville, Georgia

Consultant in the areas of the analysis of tire failures, tire and pavement adherence characteristics, vehicle handling, vehicular accident reconstruction, and mechanical failure analysis. Background in tire design, tire testing, vehicular brakes, statistical analysis, polymer plants, oil field equipment, liquid and natural gas equipment, and machine design.

1977 to November 1987
Position: Research Engineer
Michelin Americas Research
& Development

Five years experience in truck tire adherence and endurance testing. Responsible for testing quality, track evaluations, application of S.P.C. (Statistical Process Control) to track operations, operator training, vehicle modifications, vehicle calibrations and test reports. Provided technical justification and design for new test track. Installed and verified light truck tire test hub in vehicle. Taught S.P.C. course to engineers and operators.

Four years in truck tire design including concept, testing and evaluation. Developed and put into production the XDA and XDL tires, the XM+S4 in pilot sizes and several light truck tires.

One and one-half years in machine tire testing. Responsibility for startup and verification of testing machines, test method development. Operator training and development of statistical analysis. Started operation of rolling resistance, cornering force and ozone testing machines.

1974 to 1977
Position: Project Engineer
Celanese Plastics
Greer, South Carolina

Responsible for the design, purchasing, installation and startup of projects in polyester film plant. Developed new die design and new filter handling system.

1973 to 1974
Position: Project Engineer
Exxon Company, U.S.A.
Lafayette, Louisiana

Started as an associate engineer in charge of workovers for several inshore fields. This included responsibility for initial preparation, development of detailed procedures, daily surveillance of work with regular communication with field personnel and development of alternative procedures, if necessary. Promoted to project engineer after eleven months.

1970
Position: Project Engineer
Buckeye Cellulose Corporation
Perry, Florida

Responsible for the design, cost estimate and requisition of parts for plant-wide projects. Experience in material handling, polymer die manufacturing, and metallurgy.

C. Professional Registration
State of Georgia Registration No. 18709

D. Professional Affiliations

Society of Automotive Engineers

E. Seminars and Courses

"Automobile Vehicle Dynamics", Society of Automotive Engineers – January 1994

"Tire Forensics for the Accident Investigator", Institute of Police Technology and Management – July 1991

"General Engineering Refresher", Georgia Tech/ Southern Tech – February – March 1990

"Kepner-Tregoe Problem Solving and Decision Making", Michelin Americas Research and Development Corporation – February 1987

"Programming in SAS" (Statistical Analysis System), Michelin Americas Research and Development Corporation – April 1986

"Advanced Applied Statistical Methods", Michelin Americas Research and Development Corporation – October-November 1985

"Statistical Process Control", Michelin Americas Research and Development Corporation – September 1985

"SAS" (Statistical Analysis System), Michelin Americas Research and Development Corporation – April 1985

"Rubber Technology", Michelin Americas Research and Development Corporation – January 1983

"Conversational French", Michelin Americas Research and Development Corporation – February-March 1980

"Intermediate French", Michelin Americas Research and Development Corporation – October 1978-January 1979

Exhibit B To Memorandum Of Law In Support Of Plaintiff's Motion For Reconsideration

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

AFFIDAVIT OF GEORGE EDWARDS

My name is George R. Edwards. I live at 8603 Loftingham Court, Louisville, Kentucky. I am the President of Edwards and Carlson, Inc., of 4000 Shelbyville Road, Louisville, Kentucky. I have personal knowledge of the following facts:

1. George Edwards, Inc. is in the business of providing expert consulting and testimony for the purposes of litigation, including the examination of automobile, light truck, and heavy truck tires and accident reconstruction.

2. George Edwards, Inc. was retained by Plaintiffs' counsel in this case to analyze whether a certain tire manufactured by Kumho and marketed as a Hercules Superior XII failed due to abuse or defect.

3. George Edwards, Inc. received said tire on July 1, 1993.

4. On receiving the tire, I examined the tire and observed the following:

The tire had failed due to a tread and outer belt separation. Pieces of the tread and outer belt were detached from the carcass.

5. I used the following technique to determine whether the tire had failed due to abuse or defect:

The tire was examined using the principals of failure analysis. The nature and extent of the

failure was determined. Then all possible causes of the failure were analyzed and evaluated. This particular tire failed due to a tread and outer belt separation. The majority of the tread and outer belt had detached from the carcass of the tire. This would cause serious disturbances to the vehicle stability as well as other problems. A tread and outer belt as well as every other component of a tire are held together by the adhesive properties of the rubber components to each other or by the cohesivē properties of each component. When either of these properties fail, the tire "comes apart" and a failure occurs.

The analysis of component failure involves determining whether the tire failed due to fracture of fatigue. This tire failed in a fatigue mode because of the chaff and polish found at the failure process had occurred over several miles not due to one large overload (fracture). The tread depth was measured at several points on the tire. This helped to evaluate several possible causes of the tire failure. The bead area was examined to evaluate some forms of abuse which can occur. A production defect was found in this area in this area in the form of an uneven and inadequate protectors rubber. The sidewall rubber and cords were examined and found to have no serious deterioration or discolorations. There were also no signs of significant impact. A puncture which had been repaired was examined and evaluated. There were no signs of a progressive failure in this area.

6. After completing my examination of the tire, I determined that it had failed due to defect for the following reason:

A defective adhesion in the tread belts system. The internal structure of a tire should far out last the tread under normal use.

7. The technique used for determining the cause of tire failure has been subjected to the following forms of peer review:

The techniques used for determining the cause of the tire failure falls under the general title of "Failure Analysis". These techniques have been used in almost every discipline where failures occur. The factors mentioned above are recognized by tire companies, tire experts, recappers and trackers as important factors for determining tire failure modes. I have inspected thousands of tires over 50 years in the tire industry. I have been retained as a consultant to the president of Goodyear Tire & Rubber Company.

8. It is generally accepted that tire failure due to defect has occurred when the tire fails under normal and expected case. A tire carcass should far out last the wear life of the tread. A tire such as this is expected to be recapped. This means that the tire carcass should last at least twice as long as the tread.

9. I carefully examined the tire for the described factors before concluding that the Kumho-manufactured Hercules Superior XII tire in question had failed due to a manufacturing or design defect. Because I was unable to travel to Mobile, Alabama for the deposition, I reviewed my empirical data, analytic method, and conclusions with my associate, Mr. Dennis Carlson, prior to the time that he was deposed in the case of Carmichael v. Samyang Tires, Inc. On his arrival in Mobile, Mr. Carlson's examination of the tire, combined with the results of my own

testing, led him to agree with my conclusion that the tire failed due to defect.

/s/ George R. Edwards
GEORGE R. EDWARDS

/s/ Dennis Carlson
DENNIS CARLSON

SUBSCRIBED AND SWORN TO before me this 15th day of April, 1996.

/s/ Vivien B. Keane
VIVIEN B. KEANE
Notary Public, State at Large, Kentucky
My Commission expires:
Feb. 24, 2000

Exhibit C To Memorandum Of Law In Support Of Plaintiff's Motion For Reconsideration

IN THE UNITED STATES DISTRICT COURT FOR THE SOUTHERN DISTRICT OF ALABAMA SOUTHERN DIVISION

[Caption Omitted In Printing]

AFFIDAVIT OF R. JEFFREY PERLOFF

STATE OF ALABAMA)

COUNTY OF MOBILE)

Before me, the undersigned authority personally appeared JEFFREY PERLOFF and who first being made known to me and duly sworn to speak the truth deposes and says as follows:

My name is Jeffrey Perloff. I am one of the attorneys for the Plaintiffs in the above-styled cause. I am licensed to practice as an attorney in the State of Alabama and am admitted to practice before the United States District Court for the Southern District of Alabama. On February 16, 1996, I filed a Brief in Opposition to the Defendants Motion for Summary Judgment on behalf of the Plaintiffs. Subsequently, I learned that this Honorable Court granted the Defendants' Motion for Summary Judgment.

In reviewing the order of this court granting Defendants' Motion for Summary Judgment and in which was dated April 1, 1996, I noted that on page 12, the Court stated "though the Plaintiffs claim that the Defense tire expert, Dodson, uses the same method of analysis as that employed by Carlson, the excerpted portions of Dodson's

deposition provided by Plaintiff lend no support to this contention." After reading this portion of the opinion, I reviewed the "excerpted" pages referred to in Plaintiffs' brief. In doing so, I noticed that footnote 2, located on page 10 referenced Dodson's (Defendant's expert) deposition pages 44-47 but however, said footnote did not reference pages 53-57 of Dodson's deposition. I intended to reference pages 53-57 of Mr. Dodson's deposition in support of the contention that his methodology was identical to Carlson's. Pages 53-57 were inadvertently omitted from the reference by virtue of a typographical error.

Further affiant sayeth not.

/s/ R. Jeffrey Perloff
R. JEFFREY PERLOFF

STATE OF ALABAMA)
COUNTY OF MOBILE)

Subscribed and sworn to before me on this
the 12th day of April, 1996.

/s/ Carol M. Fletcher
NOTARY PUBLIC
My Commission Expires: 3-26-2000

– Additional Excerpts of Dodson Deposition

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

* * *

[p. 53] A No. I think I might have some. Let me see. Yeah. I have Plaintiff's Supplemental Responses to Defendant Kumho's First Set of Interrogatories and Request for Production. I think that's it, sir.

Q All right. What have you got in here?

A That's Mr. Carlson's deposition. The first portion. The second portion of it I don't have.

Q Have you read the second portion?

A I have reviewed it. I didn't bring it with me. It was too much to carry.

Q Did you make any notes about Mr. Carlson's deposition?

A No.

Q Did you make any notes, any writings, on the copy that was sent to you?

A No, sir.

Q All right. We talked about what all you have reviewed and done in preparation for giving your opinion here. Have you told me everything?

A Yes, sir, I think so.

Q Did you do any – well, let me ask you this, when you had the tires to examine them, what did you do?

[p. 54] A Conducted a visual nondestructive examination.

Q Did you take some pictures?

A Yes, sir.

Q And I have these set of pictures that you took here; –

A Yes, sir.

Q – is that correct? It's Plaintiffs' Exhibit 2-A Through W?

A I think that's correct, yes, sir.

Q Would this represent all of the pictures that you have taken?

A Of the subject tires and companion tires, yes, sir.

Q Any other pictures that you have taken, or had taken on your behalf, for this case besides these?

A No, sir.

Q Did you do any x-rays?

A No, sir.

Q You visually inspected the tires. You made these pictures. What else?

A As it relates to these tires, that's it.

Q How long did you view or review the tires?

[p. 55] A On two separate occasions, probably three or four hours the first time and then I had the tires at our facility for a day subsequent to that time. I spent the majority of the day with the tire.

Q All right. I have been provided with your report. Is there any correspondence to or from you and Kumho's lawyers who are here?

A I am sorry?

Q Any letters, besides the report that I have been provided with, between you and Kumho's lawyers?

A Oh. Okay. I understand what you're asking. Just cover letters saying, you know, here is what I have done and here is the bill type thing.

Q All right. Did you render any preliminary opinions to them before you produced this opinion on – was it December 11th?

A Sure. Verbally.

Q All right. Do you have any record or any notes, time slips, whatever, that would indicate when you spoke with them?

A Not specifically, no, sir.

Q Can you remember?

A Well, I mean, I spoke with them off and on [p. 56] for, you know, the last year and a half. As far as rendering an opinion to them about what happened to the tire, I did that the day I examined the tires back in May of 1994. And I did that subsequent to that time when the tires were shipped to us, and I can tell you when that is if you will give me a moment.

Q Take your time.

A And back in September, September 16th of – September 15th of 1994.

Q Can I see that, please, sir?

A Sure.

Q Who is D. Brian Rattliff, Ogden, Newell and Welch, Louisville, Kentucky?

A I have no idea.

MR. BABINGTON: Off the record.
(Off the Record Discussion.)

BY MR. JACKSON:

Q When did – and you might have answered this. When did you first give an opinion, orally or written, to Mr. Babington or Mr. Herlong?

A Back in May of 1994. May 26th.

Q Do you have some correspondence about that or was it orally?

[p. 57] A Well, any opinions I gave them, they were all oral opinions, but I have the notes that I took when I examined the tire at that time.

Q All right. Could you look at those notes and, as best you recall, tell me what was said in that conversation?

A No. I mean, the notes don't have any direct correlation of what was said in the conversation. The notes are observations about the tires, which I completed during my examination of the tires. And then my opinions are my opinions, which are separate from that.

Q Could I see the notes –

A Oh, sure.

Q – you are referring to?

A No problem at all.

Q These measurements that are on here, were they performed in Mobile?

A Yes, sir.

Q And where did you take those measurements?

A At their offices.

Q Is that where the tires were?

A Yes, sir.

* * *

Plaintiff's Exhibit 3 To Deposition

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION

Smithers Scientific Services, Inc.

425 WEST MARKET STREET •AKRON, OHIO 44303-2099

WORLD HEADQUARTERS
PH: 216/762-7441 FAX: 216/762-7447

December 11, 1995

Joseph P. H. Babington, Esq.
Helmsing, Lyons, Sims & Leach
Suite 2000, Lacleade Boulevard
150 Government Street
Mobile, Alabama 36602

P.O. Box 2767
Mobile, Alabama 36652

Re: Carmichael v. Samyang Tires Inc., et al
Your File No.: 3834-6539
Smithers File No.: OT/6142/054

Dear Mr. Babington:

I have completed my visual and tactile examination of the P205/75R14 Hercules Superior XII tire bearing DOT lot number H2ADYPU068 which you provided to me to determine the cause of its unserviceability. In addition to the subject tire, I also examined three mounted companion tires marked and identified as follows:

LR Hercules DSRII
P205/75R14
DOT 4PKCHK9150

LF Sears Guardsman Response XL
P205/75R14
DOT CHKC244341

RF Sears Guardsman Response XL
P205/75R14
DOT CHKC244341

All of the tires were examined at the offices of Helmsing, Lyons, Sims & Leach in Mobile, Alabama on May 26, 1994.

Subsequent to my examination of the subject component parts, I have also reviewed the July 9, 1993 Alabama Uniform Traffic Accident Report pertaining to this accident; the depositions of Fai E. Jones Matthews and Dennis Carlson; and photographs of subject vehicle taken post accident. Although all four tires were examined, this report will be primarily directed towards the observations and conclusions formed regarding the right rear tire from the subject vehicle. My opinions in this case are all to a reasonable degree of scientific probability and are based on my education, training, experience and examination of the subject tires. I have enclosed for your review my resume, fee schedule and previous testimony that I can recall.

The right rear tire on the Ford Aerostar vehicle was no longer serviceable due to the detachment of the vast majority of tread and #2 belt from the #1 belt and carcass with the associated partial detachment of the #1 belt from the radial carcass plies. At the time of the detachment, the tire had worn away approximately 90% of its original tread. In my opinion, the detachment was caused by a combination of overdeflected operation and intracarcass

pressurization. The two conditions combined to generate excessive heat and internal friction within the tire which weakened its structure. Ultimately the weakened structure could no longer withstand the stresses of operation and the tread and belts detached with the associated final deflation of the assembly. During my examination of the subject tire, I noted several conditions indicative of abusive overdeflected operation including very severe bead compression grooves, bluish discoloration of the rubber due to oil migration, accelerated tread shoulder rib wear, and an abraded puncture hole which had been patched. Bare polyester body cords indicated intracarcass pressurization in the tire structure.

I found no defects in the subject tire that caused or contributed to its unserviceability. It was no longer serviceable due to prolonged overdeflected operation with intracarcass pressurization.

The three companion tires submitted for examination were all mounted as received. Each tire was significantly worn and showed accelerated tread wear on each shoulder rib relative to the remainder of the tread surface. The bead compression grooves visible on the companion tires were deep and wide, indicative of overdeflected operation.

To identify positions on the tire, the serial sidewall was considered to be a clockface, with the DOT serial number at 12:00 o'clock. When viewed from the opposite serial side, the numbers ran counterclockwise so that 3:00 o'clock on the serial side was also 3:00 o'clock on the opposite serial side. The tread ribs and grooves were numbered from the serial side.

During my examination of the right rear subject tire, I noted the following information molded on the tire's sidewalls: P205/75R14 M+S Hercules, Superior XII, Steel Belted Radial, Tubeless, Made In Korea, Standard Load, Max. Load 1532 Lbs. (695 KG) At 35 PSI (240 KPA) Max. Press. Tread Steel 2 + Polyester 2, Sidewall Polyester 2 Plies, Treadwear 240 Traction A, Temperature B, DOT H2ADYPH068.

As received for examination, the complete tread and #2 belt were detached except for approximately one-half of the width of the serial side shoulder rib. Three sections of detached tread and #2 belt were returned with the tire and were refitted as follows:

#1 Major section covers approximately 9:00 o'clock to 3:00 o'clock

#2 Small section covers approximately 6:00 o'clock serial side to 8:30 o'clock opposite serial side

Sections #1 and #2 adjoin near 8:30 o'clock in the opposite serial shoulder area.

#3 Small section covers approximately 3:00 o'clock to 6:00 o'clock and adjoins sections #1 and #2 above.

The tire had a five rib, four groove tread pattern with the following remaining tread depth profile, measured in 32nds of an inch:

	#1	#2	#3	#4
12:00	3	3	2.5	.5
3:00	2.5	3.5	3.5	2
6:00	2	3.5	4.5	4
9:00	3	3.5	4	1.5

The opposite serial shoulder rib was dished out around a significant amount of its circumference. It was worn to the base of the grooves in the 8:30 o'clock to 9:00 o'clock area.

The #1 steel belt was pulled from the radial body plies of the tire between 6:00 o'clock in the opposite serial shoulder area and 9:30 o'clock in the serial shoulder area. The tears were multi-level and crisp. At 8:30 o'clock, there was a major radial carcass split from the opposite serial buttress area to the mid-serial sidewall. In the serial shoulder area, there were numerous broken radial body ply cords.

There were two punctures noted in the subject tire. One puncture was at 9:00 o'clock and extended into the steel belts. A second improperly repaired puncture was located at 4:00 o'clock in the #1 tread groove. The second injury was a clear and distinct puncture hole with abrasion visible on the tread surface. The injury was patched with a 1¾" in diameter inside repair patch but was not filled.

Both beads of the tire had very severe compression grooves. The groove on the opposite serial side bead extended through all of the rubber chafer fabric and into the body cords. Examination of the steel wheel submitted with the tire showed a fretting damage to the rim flange caused by the exposed radial body cords and severe overdeflection. The serial side bead toe was cut and gouged between 1:00 o'clock and 3:00 o'clock, nearly exposing the radial body cords. Both sidewalls of the tire showed run low abrasion damage in the area of the name lettering.

Balance weight impressions and balance weighs on the wheel were used to realign the tire to the wheel and place the valve at 7:00 o'clock on the serial side of the tire.

The steel wheel submitted with the tire was severely damaged on the valve side flange. The flange was flattened and gouged 360° around its circumference. The face of the flange was very severely abraded.

I have previously provided to you photographic prints which document my observations. If after your review you have any questions, please do not hesitate to call me.

Sincerely,

/s/ Thomas M. Dodson, SM

Thomas M. Dodson
Director, Technical Consulting

TMD:sm